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JULY-AUGUST
1928

The Journal of The American Museum of Natural History

HAWTHORNE DANIEL
Editor

A. KATHERINE BERGER
Associate Editor

CONTENTS

DANCE OF THE FALSE FACE SOCIETY, IROQUOIS INDIANS ..... *Cover*
Painted by Arthur A. Jansson, from Masks in the American Museum

PERS GLACIER, IN THE SWISS ALPS ..... *Frontispiece*

THE LORE OF THE DEMON MASK ..... Clark Wissler 339
False Faces Used by Primitive Peoples

CANADA'S LAND OF THE MIDNIGHT SUN ..... O. S. Finnie 353
The North West Territories and the Arctic Coast

A JUNGLE RIVER JOURNEY ..... Herbert S. Dickey 367
Up the Amazon and Rio Negro and Down the Orinoco

LIVING GLACIERS ..... Chester A. Reeds 379
How Rivers of Ice Are Formed

THE EGYPT OF AMERICA ..... J. Alden Mason 394
A Short Outline of Maya Civilization

DESERTED CITIES OF THE CLIFFS ..... Pliny E. Goddard 407
The People Who Have Dwelt in the Great Southwest

PEOPLE OF THE FOGGY SEAS ..... Waldemar Jochelson 413
The Aleuts and Their Island

WINGS ON THE YALU ..... William Douglas Burden 425
Hunting Ducks and Geese on a River in the Far East

THE CAVE TIGER OF AMOY ..... William Lord Smith 430
On the Trail of a Man-Eater of China

THE INTERNATIONAL CONGRESS OF AMERICANISTS ..... Clark Wissler 439

NOTES 441

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A SCENE IN THE ALPS MOUNTAINS, NEAR ST. MORITZ, SWITZERLAND

Crevassed and weathered surfaces of the lower portion of the Pers glacier appear in the foreground, while in the upper levels the snow-covered ice cataracts (*Vadret da Pers*) lie between ridges of dark rocks. In the distant background gray clouds merge with the high snow-capped peaks of Pizzi di Palü, 12,040 feet above the sea. *See Page 379, "Living Glaciers"*

VOLUME XXVIII

NATURAL HISTORY

NUMBER FOUR

JULY-AUGUST, 1928

THE LORE OF THE DEMON MASK

How Savages and Barbarians Make Use of False Faces in Their Weird Religious Ceremonies. Ancient and Modern Uses of These Strange Masks Among the Natives of America and Other Parts of the World

By CLARK WISSLER

Curator-in-Chief of Anthropology, American Museum

THE use of "false faces," or masks, is an old trick of the human race. The museum visitor, viewing the weird and often grotesque masks on exhibition, may be moved to speculate as to the meaning of these caricatures and to wonder why so much space is allotted them. For example, an exhibit concerning the Iroquois Indians of New York is certain to contain a number of curious masks, because these Indians maintain a unique society for men known to us as the False Face Society. This name calls attention to the most striking outward feature of this society, the wearing of masks, such as are shown in the cover design of this number of NATURAL HISTORY.

There is something impressive in Iroquois "false faces," as many museum visitors have testified; they have a striking individuality, especially in the treatment of the eyes and the mouth. Carved from single blocks of wood, with cavernous eye holes, strong nose, and protruding lips, the face framed in with long hair falling loosely from a wig: such images peering from the shadows of the open fire, around which Indians love to gather, impress themselves too deeply upon the mind to be forgotten. Those of our readers who saw the play "Hiawatha," as presented some years ago, or the film made from it, will recall the striking entry of the False Face dancers, their slouching gait, and above all, their strange, awful mien.

But the Iroquois are not the only Indians who use masks; on the contrary, the practice is widespread. The totem-pole makers of Alaska and Vancouver Island also are celebrated for their wooden masks, which far excel in variety and size those of the Iroquois. Visitors to the American Museum collections may recall these wooden masks, painted in black, red, and green, especially a few huge masks, seemingly too large and heavy for one person to support.

The masks of the Iroquois represent faces essentially human, whereas these larger masks of the totem-pole makers depict animal and bird monsters. Not infrequently the jaws of these masks are hinged so that the dancers can open and

TWO MASK CEREMONIES OF THE NAVAHO INDIANS
At the left a man masked to represent a god is driving out disease by shaking his rattle over the patient, while the naked youth at the right is a novice undergoing an initiation rite

close them at will, and often when the mouth of the mask is opened in this way, a human face appears within. This is not however, altogether a matter of fancy for throughout the myths of primitive folk runs the idea that those who have power can change at will from human to animal form and back again.

Thus the frequent reader of Indian tales is familiar with such incidents as "Now a raven appeared and spoke to him, but as the raven came nearer, it became a person standing there." Certain large wooden masks of the Indians of Vancouver Island are so constructed that the dancers are able to demonstrate such a supernatural transformation of the mythical raven into a person; the outward forms of these masks represent the raven, but when concealed cords are pulled, the wearer of the mask opens the raven face, and that of a human appears inside. Few peoples have carried this idea out so ingeniously in the construction of their masks as have these wood-carving Indians of Alaska and the Canadian Coast.

NEW IRELAND
CEREMONIAL MASK

J. G. Swan, one of the early visitors to these Indians, writing as an eyewitness, says,

> . . . The masks are made of alder, maple, and cottonwood; some are very ingeniously executed, having the eyes and lower jaw movable. By means of a string the performer can make the eyes roll about, and the jaws gnash together with a fearful clatter. As these masks are kept strictly concealed until the time of the performances, and as they are generally produced at night, they are viewed with awe by the spectators; and certainly the scene in one of these lodges, dimly lighted by the fires which show the faces of the assembled spectators and illuminate the performers, presents a most weird and savage

spectacle when the masked dancers issue forth from behind a screen of mats, and go through their barbarous pantomines. The Indians themselves, even accustomed as they are to masks, feel very much afraid of them, and a white man, viewing the scene for the first time, can only liken it to a carnival of demons.

A MASK FROM JAVA

However, it was not alone the totem-pole-carving Indians of Vancouver Island and Alaska, who indulged in such impressive and picturesque pastimes, for the Aztec of Mexico, their predecessors, and the prehistoric Maya of Yucatan, seemed to have specialized in masks. The former have left behind a number of curious manuscripts in picture writing, showing gods and heroes wearing masks. The Maya were expert carvers in stone, covering their temple walls and stone monuments with carvings in low relief, among which may now and then be seen masked figures. Nor was it only among the peoples of the Americas that such masks were used, they were used in the Old World as well. In present-day China, India, Java, etc., one meets with processions and festivals in which masked figures play the chief rôle, for the most part survivals of ancient customs.

Often when observing a custom so widespread as the use of masks, the thought arises that here is something of special importance in the life of man, and a custom whose beginning dates back to the dawn of civilization. At any rate, a custom that appears to be world-wide and an-

PUEBLO INDIAN ALTAR SHOWING REPLICA OF MASKED DANCERS IMPERSONATING GODS

INDIAN IN KACHINA DANCE COSTUME
From a painting by Louis Akin

cient seems to be worthy of serious study.

Turning again to the Iroquois Indian False Face Society, we note that there are in this company at least four classes of false faces: doorkeeper faces, those worn by doctors when treating the sick, the beggar masks, and what are spoken of as secret masks. Many individual masks have names according to the mythical being they represent, usually certain stone giants that play a large rôle in the beliefs of these Indians; one of the myths accounting for the origin of the Go-gon-sa false face was recorded by Mrs. Harriet Maxwell Converse as follows:

It could see behind the stars. It could create storms, and summon the sunshine. It empowered battles or weakened the forces at will. It knew the remedy for each disease, and could overpower Death. It knew all the poison roots and could repel their strong evils. Its power was life, its peace the o-yank-wah, the tobacco which drowsed to rest. The venomous reptiles knew its threat and crept from its path. It would lead the young hunter back to his people when the Stone Giant directed. It said: 'My tree, the basswood is soft, and will transform for the molder. My tree wood is porous, and the sunlight can enter its darkness. The wind voice can whisper to its silence and it will hear. My tree wood is the life of the Go-gon-sa. Of all in the forest there is none other.'

With this knowledge, the young hunter started on his way carving go-gon-sa-so-oh, (false faces). From the basswood he hewed them. By the voice of the Stone Giant he was guided to choose; and well he learned the voices of all the forest trees before he completed his task.

In his travels he met many strange animals and birds, which he detained until he had carved them in the basswood; and inviting them to tarry, learned their language and habits; and though fearing the Giant's reproval, for he constantly heard his voice encouraging or blaming, he learned to love these descendants of his ancestors, and was loath to leave them when compelled to return to his home.

Many years had passed in the laborious task, and he who entered the cave a youth, had become a bent old man when, burdened with the go-gon-sas he had carved, he set out on his return to his people. Year after year his burden had grown heavier, but his back broadened in strength, and he had become a giant in stature when he reached his home and related his story.

JAVANESE FESTIVAL MASK

In a general study of masks, the first questions to arise are, "What place do masks hold in the interest of primitive peoples? What kind of ideas and beliefs are associated with them?

If we begin with our own civilization and time, we see the mask as a frivolous object; the clown or the silly buffoon may use it to heighten his grotesqueness; children and young people may use masks on fête days to amuse adults and to frighten the timid. Occasionally they are still used upon the stage when some of our ancestral folklore is to be enacted.

Yet, on the whole, the mask is to us something childish, something scarcely to be considered respectable. Consequently, when we stand before a museum case, or look over the pictures in a book, we are puzzled how to justify the attention given to the subject of masks by serious-minded people; we may go even further and assume that the people who made and used these masks were infantile in their interests, so far benighted as to be beyond understanding. This is in keeping with one of our bad intellectual habits, viz., attributing our own ways of thinking to the savage mind. Because we put no value upon masks, tolerating them only in light, frivolous associations, we fail to see how savages could regard them otherwise, even such savages of ancient Europe as were our ancestors.

PLAINS INDIAN DOG DANCER
Drawn by Bodmer

JAVANESE FESTIVAL MASK

When seriously used, masks are part of the regalia worn in savage ceremonies, chiefly religious. Such ceremonies may have many features, but most of them possess regalia and a ritual in which are songs and dances. Here, again, we often misjudge the savage, for to us a dance is anything but religious, and so his dancing upon such occasions, if it does not shock us, at least provokes pity for his lack of understanding. On the other hand, anthropologists who specialize in the study of primitive life, find in the regalia, songs, and dances what they regard as important

SUN DANCE OF THE ARAPAHO INDIANS
Masks are not used, but the faces of the dancers are painted. This particular type of ceremony was common among the Plains Indians, particularly of the northern plains, but was unknown among the woods dwellers

data for the understanding of human life.

If the reader goes to a library and asks for special publications upon the American Indian, for example, long detailed studies of ceremonies will be given to him, describing minutely just how the participants were dressed, what they did, sang, and danced; further, an attempt will be made to explain the meaning of the ceremony. Any reference librarian can give a long list of such books, which means that many tribal ceremonies have been studied in every part of the world — Asia, South America, Australia, Africa, and elsewhere —and looking over these detailed descriptions of savage ceremonies, one finds them much alike.

No matter to what part of the world we turn, we find the belief that these ceremonies, songs, and dances were not designed by man, but were given to him ready made and in some mysterious fashion, just as in the case of the Iroquois Indian who started the False Face Society. Someone, at some time—usually in the good old times now passed—met a supernatural being who taught him the whole ceremony.

BELLA COOLA MASK FROM BRITISH COLUMBIA

For example, an interesting Indian tale recounts the experiences of a young man who wandered out alone. Coming at last to a place where the beavers had a dam and their houses in the water, he sat down to meditate. These beavers, he thought to himself, must possess some extraordinary power to do as they

BELLA COOLA MASK FROM BRITISH COLUMBIA

do, and so he resolved to sleep there, hoping that the chief of the beaver might take pity on him and help him to attain to a place of power and respect among his own people. That night a beaver appeared before him, turned into a person, and invited him to follow; they passed down into the water and into the house of the beaver. It was a great lodge and his guide was the chief of all the beaver. Here the young man saw many beaver and here he stayed throughout the winter as the guest of the beaver. When spring came, however, the young man expressed a wish to return to his people. So the beaver called into his lodge all the head beaver and, becoming like people, they performed a ceremony, teaching the young man the songs, dances, etc. Then he was conducted to the dry ground, to his old camping place, and so returned to his people, where he started the ceremony he learned from the beaver.

When we review this tale, we note, first, that there appeared to the Indian a beaver which took on human qualities, because it spoke to the Indian and conferred upon him powers and imparted information, and so the Indian started a ceremony. But what is this ceremony like? It begins with a narrative like the preceding; then the leader of the ceremony takes

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IROQUOIS FALSE FACE SOCIETY ENTERING THE DANCE LODGE

The cover painting of this issue of NATURAL HISTORY shows another aspect of a dance by these masked Indians

DOUBLE MASK USED BY THE HAIDA INDIANS

CEREMONIAL MASK OF A NORTH PACIFIC COAST TRIBE

the part of the beaver, other participants are the beaver's helpers and, finally, one person takes the place of the original hero, who is said to have been received into their lodge by the beavers. The ritual which follows is supposed to repeat the events, step by step, by which the beaver conferred this ritual upon the first Indian. In other words, the incident is staged with an appropriate cast and the participants become, in a way, players presenting a drama.

This not only applies to this particular ritual, but is well-nigh universal among mankind, primitive and civilized. Naturally rituals and symbolic procedures believed to have originated with mythical beings cannot well be demonstrated except through the impersonation of these mythical beings who, as we have stated, while often conceived of as animals or birds, are also human, having a kind of alternating personality, exceeding the power of real human beings as well as animals in that they can change their bodily forms and do other things impossible for either animals or humans.

The wearing of a mask is the usual method of impersonating these mythical human beings or their animal counterparts. When the American Indian impersonates the buffalo, he may put the skin of the head over his own head, and look out through the eye holes; the effect may be heightened by having the whole skin fall over the shoulders of the wearer and down the back, the characteristic buffalo tail dangling below. Also the bear plays a part in the myth-

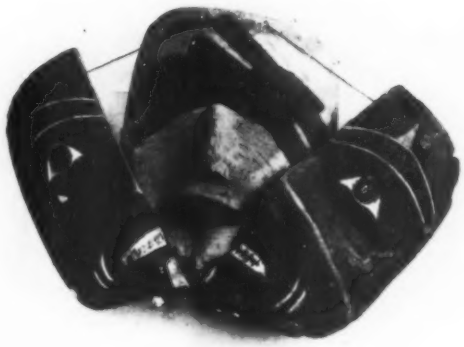
MASK FROM BAKETE, AFRICA

ologies of many peoples and so is impersonated with great frequency; sometimes the face of the bear is realistically carved in wood, to which the skin of a bear is attached; drawing this over his head, the savage will crouch and growl, and by skillful acting give a satisfactory representation of a bear.

A spirited description of a masked Indian dance is given by George Catlin, the famous Indian traveler:

My ears have been almost continually ringing since I came here, with the din of yelping and beating of the drums; but I have for several days been peculiarly engrossed, and my senses almost confounded with the s t a m p i n g, and grunting, and bellowing of the buffalo dance. . . .

Every man in the Mandan village is obliged by a village regulation to keep the mask of the buffalo hanging on a post at the head of his bed, which he can use on his head whenever he is called upon by the chiefs to dance for the coming of buffaloes. The mask is put over the head, and generally has a strip of the skin hanging to it, of the whole length of the animal, with the tail attached to it, which, p a s s i n g down over the back of the dancer, is dragging on the ground. When one becomes fatigued of the exercise, he signifies it by bending quite forward, and sinking his body toward the ground; when another draws a bow upon him and hits him with a blunt arrow, and he falls like a buffalo—is seized by the by-standers, who drag him out of the ring by the heels, brandishing their knives about him; and having gone through the motions of skinning and cutting him up, they let him off, and his place is at once supplied by another, who dances into the ring with his mask on; and by this taking of places, the scene is easily kept up night and day.



DOUBLE MASK FROM BRITISH COLUMBIA

CEREMONIAL MASK FROM VANCOUVER ISLAND

WOODLAND INDIAN MASK

That dancing with an animal mask is an old, old, custom, is shown by certain Stone Age pictures upon the walls of caves in France. One of these shows a dancer wear-

MASK FROM NEW IRELAND

ing the skin and head of a deer, while in another cave are three dancers in a row, with heads and skins of chamois, or similar animals. These last seem to be dancing by jumping up and down, holding the feet together, as do the native women in Australia when imitating the kangaroo.

As a rule, the steps in these dances are simple, but body movements are emphasized. The dancer is not merely enjoying the rhythm and excitement of the procedure, but may well be dancing as the impersonator of the animal or hero figuring in the ritual of the occasion. The swaying movements, the strutting and the stooping, are all conceived to be representative of the leading animal or hero. A particularly forcible illustration of this is to be seen in the Eagle Dance of our Southwestern Indians as, covered with down like an eaglet and with rows of feathers down the arms and a tuft for a tail, the dancers, in stooping position, simulate the soaring of the eagle.

Assuming that these masks originally developed from a simple beginning, we may properly ask as to the nature of that simple first step. However, while everyone is interested in the origins of human customs, such origins are so elusive that many serious-minded students of the subject are inclined to doubt the possibility of finding them. Thus it has been proposed that masks were first the heads of animals; again, a device for frightening children, an outgrowth of designs upon shields, painted designs upon the face, etc. All of these guesses are plausible, but as no record of the beginnings of the

A TIBETAN MASK

FROM KASENGA, AFRICA

mask have come down to us, there seems little hope of finding the truth about the matter. We can, however, conclude that it is an old custom, known in some form to most peoples.

Yet, though we may never be sure of how masks came to be so widely used, it is not difficult to see that they offer a medium for art expression. We have referred to the Indians of Alaska, experienced carvers of wood, who have produced a number of masterpieces, many of which, though usually grotesque, are highly realistic. But for richness in conception and wealth of detail nothing seems to surpass the turquoise mosaic masks of the Aztec, in which the whole surface of the wooden mask base is overlaid with designs built up from minute bits of turquoise and other colored materials. That the earlier Maya used equally fine masks is shown by their low relief sculptures in which warriors and priests stand forth in masks and plumes. Not infrequently the sculptor, in presenting a profile, shows the face of the wearer behind the mask. If the reader imagines the great ruined Aztec temples, topping pyramids in their original grandeur, with highly decorative serpent columns, with brilliant wall paintings representing processions of plumed warriors and priests, and then in imagination tries to see the priests officiating at the altar, wearing masks encrusted with turquoise and topped by rich plumes, he will have some idea of the artistic heights to which the mask and the staging of rituals were carried in prehistoric America.

BAMPENDE MASK, AFRICA

A KORYAK MASK FROM SIBERIA

WEST AFRICAN MASK

If we turn to the Old World, the paint-

A BELLA COOLA MASK
(Closed)

A BAKUBA MASK FROM AFRICA

ings upon the walls of temples and tombs in Egypt present priests masked to represent the gods of that religion; further, the temples of India and China present many masked images. The reader interested in the artistic aspect of masks and their relation to the theater should look up that interesting book by Kenneth MacGowan, *Masks and Demons*, in which are many good illustrations of masks, with descriptive notes.

Turning now to more prosaic problems in the use of masks by the aboriginal Indian population, some curious facts in their geographical distribution are noted. Among the Indians east of the Mississippi River and near Hudson Bay, the Iroquois were not the only ones who specialized in masks. Some use of them was made by the Cherokee, Delaware, Nanticoke, Ojibway, and Choctaw, and probably by many others. West of the Mississippi, among the Indians of the Plains, the heads of the buffalo, the bear, and other animals were sometimes worn in appropriate ceremonies, but carved masks have not been reported.

On the other hand, the western belt of high land from the Arctic to Panama is conspicuous for the use of masks. As we have stated, the practice was highly developed in Mexico and Central America, and again among the Indians of lower Alaska and the coast down to the Columbia River. Even the Eskimo of Alaska, and as far east as Hudson Bay, made use of masks.

Turning back to California, we find almost no masks, but among the Indians of Arizona and New Mexico again the cus-

IROQUOIS MASK

tom comes to the fore, the best known masks being those worn in the kachina ceremonies.

In South America, there were several highly developed civilizations in the Andean highlands, the best known being that of the Inca in Peru. There is good reason to believe that the Peruvians used masks, but these do not occur in collections; nevertheless, upon pottery, and occasionally in textiles, we observe what are certainly masks, some elaborate and some grotesque. The descendants of the Peruvians even now appear on certain Christian festival days in masquerade costumes that seem to be pagan. Of special interest, however, is the placing of masks upon the faces of the dead, not only in Peru, but in the whole of the Andean highland region from the Isthmus of Panama to northern Chile. Museum visitors are no doubt familiar with the mummy bundles from Peru, with their quaint wooden and woven faces.

A BELLA COOLA MASK
(Open)

CHINESE CEREMONIAL MASK

IROQUOIS MASK

Leaving the Andean highland and turning to the lowlands of Brazil, we meet with many reports of masked dancers. The shapes are usually those of the jaguar, alligator, tapir, birds, insects, etc. In some cases wooden masks are used, but usually they are of bark, are kept out of sight of women and children and, after the ceremony, are carefully burned. While data for many tribes in the lowlands of South America are lacking, yet, from what we have, it appears that dancing masks occur from Tierra del Fuego on the south to the Orinoco River on the north, but are infrequent in several parts of Argentine and Brazil.

It is difficult to summarize this distribution in a sentence, but the intensive use of masks is more frequent in the western highlands of the two Americas, than in other sections.

The most elaborate and also the most artistic masks were, as may be expected, among the old native civilization of Peru in South America and of the Maya and the later Aztec in Mexico and Central America. Among the simplest and crudest were those of the Eskimo of the far north and of the Ona near Cape Horn at the lower end of South America. Thus, the Ona usually cover the head and face with a piece of rawhide upon which are painted a few spots in color to symbolize the spirit represented. One particular mask of this kind, according to the descriptions of observers, bore red and white spots, the emblem of the god of the heavens. Shifting to the far north the Eskimo around Hudson Bay use a few simple masks of skin, rather loosely fitted to the face and bearing simple markings.

ANIMAL MASK FROM CENTRAL AFRICA

We mention these outlying examples to emphasize the wide distribution of the masking idea. Also, wherever used, the mask is intended to represent a spirit, or a supernatural being, and is thus an aid to the impersonation of these mythological personages. The primary association of the mask is therefore with serious religious practices, rather than with entertainment and esthetic effects, suggesting that the masked dances and stage effects of civilized peoples also have a serious religious background.

FROM VANCOUVER ISLAND

Midnight on the shores of Great Slave Lake

CANADA'S LAND OF THE MIDNIGHT SUN

The Great Valley of the Mackenzie River and the Northern Coast of Canada.—The Indians and the Eskimos, the Rivers and Lakes, the Products and the Administration

By O. S. FINNIE

Director, North West Territories and Yukon Branch, Department of the Interior, Canada

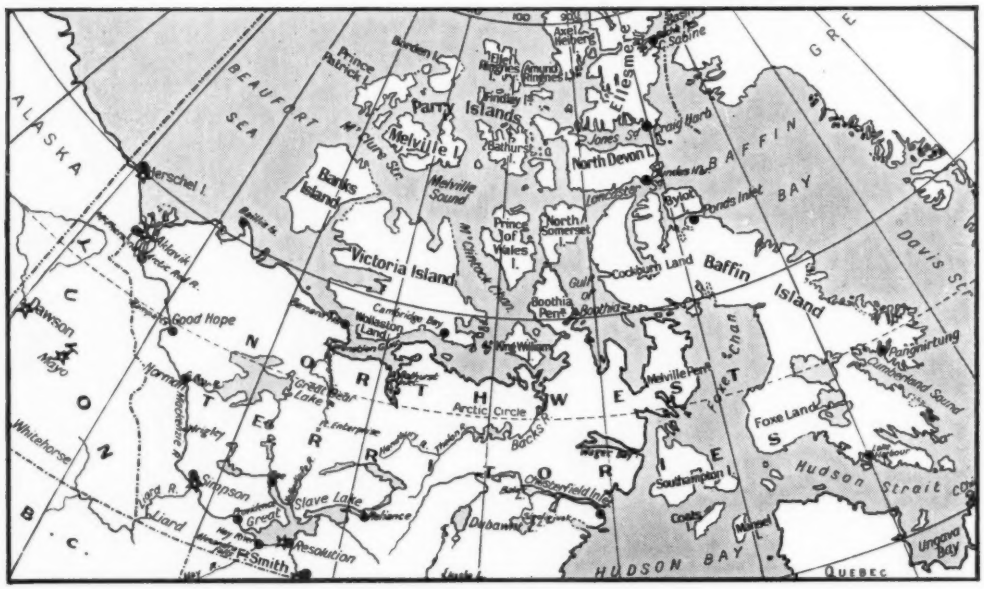
ONE million three hundred thousand square miles of Canada lying north of "sixty" are known as the North West Territories. They extend easterly from the delta of the Mackenzie River to Baffin Island, a distance of approximately two thousand miles, and reach more than fourteen hundred miles from north to south, from Cape Columbia to latitude 60° N., including all the islands in the Canadian sector as far as the Pole.

Neither the natives, nor the fauna, nor the other resources of so vast a country can be adequately described in a short article. From agricultural lands in the southern areas the country stretches to the world's most northerly headland; the natives include Indians and Eskimos speaking three distinct languages and living under as many sets of conditions; the wild life covers almost every species of land and sea mammal known to Canada, and the other potential resources of the Territories are found under a variety of conditions that differ in climate and accessibility.

The District of Mackenzie, the most important of the three main divisions of the North West Territories, can be most readily approached by the route leading north by rail from Edmonton, Alberta, to the southern watershed of the Mackenzie River. Fort Smith, the administrative center within the district, is situated on the Slave River in latitude 60° N., where a series of rapids forms a barrier to river navigation. At this point we find ourselves in the land of the Chipewyan Indians.

Should we listen to the casual conversations of the crowd, we would hear English, French, Cree, and Chipewyan used impartially, for although the language of the district is Chipewyan, the Crees from the south are well represented, and the traders and missionaries are chiefly of British and French extraction.

Fort Smith, situated on a high, sandy plateau, overlooking the river, is typical of



NORTHERN CANADA

Fort Smith is the headquarters of the administration of the North West Territories. From this trading post three routes lead north. The most important is northwest by way of Great Slave Lake and the Mackenzie River. Another leads north through Rae, and the third leads northeast through Great Slave Lake past Reliance

many of the northern posts—its principal features being Government offices, a Royal Canadian Mounted Police post, a wireless telegraph station, a mission church and house with hospital and school, and establishments of the principal fur traders of the north. To these should be added the log homes of the natives and a host of dogs which constitute the motive power of the country's winter transport. In winter Fort Smith is dark and bleak and wind-swept, and in summer it is a noted gathering place for all varieties of insect pests known to the northland, while for weeks, daylight never fades entirely from the sky.

Immediately to the west lies a country of alternate swamps and low sand ridges, difficult of access, but valuable because it has given perfect protection to the only remaining herd of American bison that has never known captivity. In 1901, the Dominion Government prohibited the killing of these animals. An estimate made about twenty years later placed their total at approximately fifteen hundred. To these have been added recently six thousand young buffalo from Wainwright National Park, and it is confidently hoped that the next decade will see an increase in their numbers great enough to make them an important factor in the food supply of the District, and possibly to warrant licensed hunting under the supervision of official game guardians.

The fur resources of the Fort Smith area have been intensively drawn upon for more than one hundred years, but still the trapper thrives. Each winter yields pelts of bear, wolves, lynx, colored foxes, fisher, otter, marten, mink, skunk, and muskrat—fox, mink, and rat predominating. It is possible, however, that the time is not far distant when fur farming will bring to many a better living than is to be secured today from the taking of wild animals.

From Fort Smith to the Arctic Ocean, a distance by water of fourteen hundred miles, river transportation is uninter-

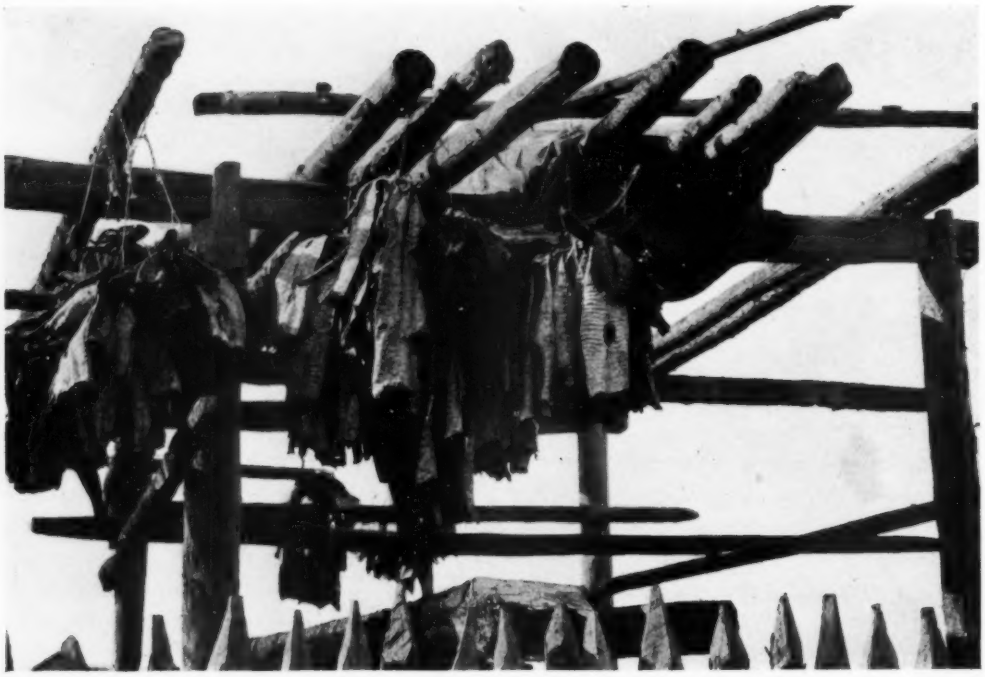
rupted. Large and comfortable steamboats serve the public, and already the excellence of their service, the novelty of the life of the lower river settlements, and the river scenery have popularized them among those on the outlook for summer tours in little known lands.

Two hundred miles of river, winding slowly through the country of the buffalo and the moose, lead from Fort Smith to Great Slave Lake. One legend of the source of the name "Great Slave" tells how, even before the advent of the trader, a white child was sold as a slave to an Indian tribe which had its home on the shores of the lake. The child grew to be a man above the ordinary stature, with long, fair hair and light-blue eyes, who lived a long life among his Indian masters. His presence led to the area being known as the "land of the great white slave," eventually abbreviated to Great Slave. The story further states that the child slave was the rightful heir to the throne of France—an interesting echo of the rumors spread by the devotees of Napoleon that the son of Marie Louise had not really died at Vienna but had been spirited away by the wily Metternich.

Another legend, quoted by the Geographic Board of Canada, is to the effect that Great and Lesser Slave lakes and Slave River were named after a tribe of Indians that once dwelt in that region. These Indians called themselves *Etchareottine*, which means "the people dwelling in the shelter of the (Rocky) mountains." In contradistinction to other northern Indians, who were caribou eaters and traveled widely in pursuit of game, the *Etchareottines* were fish eaters and kept to the lakes. When the more warlike Crees went on the warpath against the tribes on the Peace River, they came from

FORT SMITH FROM THE AIR

This trading post is situated just over the southern border of the North West Territories beside the Slave River and at the lower end of the heavy series of rapids that break river transportation at that point. Mr. Finnie is Director of the North West Territories and Yukon Branch, and this settlement, being his headquarters during the summer, must be viewed as the capital of the district



DRYING FISH AT "HAY RIVER"

Because dogs still form the most important motive power for winter transport, fish must be caught and dried in large numbers, for this is the only food given to the dogs during the long winters. In every northern trading post, drying racks of this kind are numerous

the south in canoes to Lesser Slave Lake and, leaving their canoes there, proceeded overland. Finding that the lake-dwelling Indians did not possess their own warlike attributes and ideas, the Crees showed their contempt by bestowing on the lake-dwellers the epithet "awonak" or "slaves."

By way of Great Slave Lake the traveler reaches the land of the Slave Indians, and to the babel of tongues is added still another dialect. Resolution, the most important settlement on the southern shore, is the meeting place of the Indian trappers from east and west, north and south. The southern Indians, the Crees and Chipewyans, are represented chiefly by the imported servants of the traders, this point marking the northern limit of the influence of both these nations. Three highways lead from Resolution, one to the northwest following the waters of the Mackenzie to Beaufort Sea, one due north to the country of the Yellow Knife Indians, and the third east to the lakes and plains of the Arctic prairies and the home of the caribou and musk ox.

To the east, a cruise of two hundred miles along the shores of Great Slave Lake —one of the great lakes of the world with an approximate area of 11,500 square miles—brings the traveler to Fort Reliance. From this point the trail leads overland until the headwaters of rivers flowing to Hudson Bay are reached. Here are the great Arctic prairies, a country well dowered by Nature except with trees.

From any point of vantage can be seen an apparently endless series of rolling hills plentifully endowed with grass, moss, and Arctic flowers. Sparkling lakes nestle in the valleys, and winding streams disturb the quiet of the scene as they tumble their way down their many rapids

to mingle their waters finally with those of far-distant Hudson Bay.

This rolling country is the home of the caribou, the wolf, the Arctic fox, and the remnants of the few remaining herds of musk ox to be found on the mainland. The streams and lakes are plentifully stocked with fish, and their shores are the nesting grounds of many varieties of water fowl. The potential wealth of this Arctic plains area lies in its undoubted ability to yield liberal supplies of meat and hides from caribou or other hardy animals, fish from its waters, and fur from its hills.

Humanity is but poorly represented on the Arctic prairies. A small band of Indians, who winter along the northern fringe of timber, each spring follows the caribou in their northern migration, and lives entirely upon caribou meat and fish. Eskimo from the shores of Coronation Gulf to the northwest, and coastal points to the eastward, move each spring toward the Thelon River to meet the same migration on its way to the Arctic coast. The only permanent residents are three bands of Eskimo who base their operations on the shores of Kasba, Sigoligjuak, and Baker lakes, from which points they eke out a living from the eastern sections of these northern plains.

Recently the Dominion Government set aside a large area, surrounding the confluence of the Hanbury and Thelon rivers, as a game sanctuary wherein all wild life indigenous to the country, and especially the musk ox, would have a haven of refuge from hunters, both white and native. This sanctuary contains an area of about 15,000 square miles.

Starting again from Resolution, another road leads to Rae, on a northern arm of Great Slave Lake, and the land of the Dog Rib Indians. In 1821 Franklin and

ONE STEP IN TANNING A HIDE

This Indian woman, who is a resident of Arctic Red River, which lies north of the Arctic Circle, is engaged in cleaning the hair from a hide by means of pulling it over the dull edge of the stick that she has thrust into the ground

A "LOB STICK" NEAR FORT McKAY

In order to mark trails, caches, and camps, and in order sometimes to erect memorials to former residents of the district, these "lob sticks" or "lop sticks" are prepared. Branches are lopped from the tree in such a manner as to leave it distinctive, and the trees that are so prepared usually are chosen because they stand in some conspicuous place

his party followed this route to the north. A winter camp was built half way between Great Slave and Great Bear lakes, which was known as Fort Enterprise. From this point a season was spent in exploration of the Coppermine River and the shores of Coronation Gulf. Part of this route was also followed by Hearne of the Hudson's Bay Company, when from 1769 to 1772 he pioneered the valley of the Coppermine River. One of the great tragedies of the North was enacted during this trip, when the Indians who accompanied Hearne massacred more than twenty defenseless Eskimo men, women, and children, camped at a point since known as Bloody Fall, on the lower reach of the Coppermine.

During the past winter a unique event occurred in the vicinity of Fort Enterprise about 150 miles north of Great Slave Lake, the spot where Sir John Franklin, with Lieutenant Back, spent such a terrible year of hunger and privation in 1821 and 1822. Two years ago, while an official of the Canadian Government was making a patrol from the bottom of Bathurst Inlet, five hundred miles over a bleak and desolate territory to Rae, he had with him a young Eskimo youth from Coronation Gulf. They had many adventures on the way but, on reaching Rae, the young Eskimo was delighted at what appeared to him a veritable metropolis, although it cannot boast of more than half a hundred people.

So enamored with the place was the youth that he wanted to remain, forgetting entirely the pretty wife he had left in a distant igloo. The official, however, had no intention of permitting the youth to remain, for, had he done so, the lad's tribesmen would have assumed that the white man had killed him, and so would probably have taken his own life in retaliation.

When they finally returned to Bathurst Inlet, the young native must have told his tribesmen how well they had been treated by the Indians and, as a result, the Eskimo in a body appeared shortly after Christmas at Fort Enterprise. Here, though face to face with their traditional enemies the Indians, a ten-day powwow of feast and dance took the place of bloody war.

It was the first occasion on record where groups of Eskimos and Indians from these districts have buried the hatchet, and is in marked contrast to the warlike attitude at the time of Hearne.

The Dog Rib Indians are one of the larger tribes of the North. Long association with the white trader has advanced them to a life of semi-civilization, but they still depend upon the wild life of the country for an existence. As they wander over a wide country of rocky hills, some of which are timbered, though sparsely, their harvest consists of fur, fish, caribou, and moose, with rabbits to fill in the periods when larger game is not available. Much of this area has been reserved by the Government of Canada as a hunting and trapping ground for the exclusive use of the natives.

To the west and north of Resolution lies the valley of the Mackenzie River. "Hay River," a settlement lying near Great Slave Lake in the broad valley of the river from which the community takes its name, is the home of a well conducted boarding school, two missions, and several trading establishments.

Providence lies on a level plain on the bank of the Mackenzie. The buildings of the Royal Canadian Mounted Police, of the mission with its boarding school for native children, and of the several trading companies, are practically the only permanent structures in the settlement. At points farther south the Indian and half-breed trappers have built for themselves cabins from which they pursue their activities, but the natives of the Providence district are still the itinerant people of a hundred years ago. Many of them are born, live, and die in their native tipis and brush camps.

Between Providence and Simpson on the way north, the river narrows and runs swiftly, but navigation is uninterrupted. Simpson is located on a large island just below the confluence of the Liard and the Mackenzie rivers. It is one of the larger

ALEXANDER FALLS, HAY RIVER

This waterfall, which is located about thirty miles up the Hay River from Great Slave Lake, is about 190 feet in height, and it is estimated that 80,000 horsepower could be generated if a hydroelectric plant were installed

ARCTIC RED RIVER

This post, which lies beside the Mackenzie River just north of the Arctic Circle, is in the land of the Loucheaux Indians, though Eskimos are occasionally to be seen here as well

A CACHE AT FORT MCPHERSON

McPherson lies on the Peel River well to the north of the Arctic Circle. In order to protect supplies from the ravenous dogs that abound at such posts, caches similar to this are often built

A MACKENZIE RIVER STEAMER AT FORT NORMAN
In the distance stands Bear Rock, which marks the confluence of Great Bear River with the Mackenzie. The steamer in the foreground is operated by a trading company

A VIEW FROM THE TOP OF BEAR ROCK
Looking to the west across the Mackenzie. The river is four miles wide at this point. Throughout its entire length the Mackenzie is navigable for large river steamers

LOUCHEAUX SQUAW AND PAPOOSE
These Indians live in the vicinity of Arctic Red River

settlements of the Territories, and was at one time the trade headquarters for the whole valley of the Mackenzie. Originally a typical Hudson's Bay Company fort, dating from the early days of the last century, it has grown to be a prosperous settlement with missions, hospitals, schools, a Royal Canadian Mounted Police post, a Government wireless station, a number of trading establishments, and a Government Indian Agency which conducts an experimental farm. The surrounding country, consisting of rolling hills lightly covered with timber, has up to date produced little but fur, though it is not without promise for the future. The Rocky Mountains are less than one hundred miles to the northwest, and far back in the mountains lies a valley about which little is known beyond the fact that in it hot springs are so numerous that its temperature has been materially affected. While the surrounding country suffers from a somewhat rigorous climate, the "semi-tropical valley," as it has come to be known, sees but little snow, and is the winter home of a great variety of wild life.

The Liard River is the highway serving the territory to the west. It boasts of a steamboat service, adequate to the needs of the country, which each year carries a wealth of high-grade furs to the markets of the world. The upper reaches of the Liard, penetrating far into the mountain ranges, connect through British Columbia with established routes of travel leading to the Pacific coast.

Sixty miles below Simpson the Mackenzie enters a bolder and more rugged country, and for many miles the traveler is regaled with true western mountain scenery. When the river swings back to the foothills, Wrigley, a fur post active enough in winter but presenting little of interest during the open season, is passed, and the journey is continued to Norman. This settlement stands on the high banks of the Mackenzie at the mouth of Great Bear River. The usual essentials of a northern post are here in evidence. The

COPPER ESKIMO WOMAN
From the vicinity of Tree River

country, east and west for many miles, is tributary to this post.

The Great Bear River is the highway to Great Bear Lake and the country beyond as far as Coronation Gulf, while to the west an overland trail follows the valley of the Gravel River to the headwaters of the Stewart River and on to the Yukon. The Great Bear River is shallow and swift, but can be ascended by suitably constructed power boats. Great Bear Lake is the largest lake in the northland, covering an area of something like 12,100 square miles, but its use as a transport route is limited to not more than three months in each season, as it is ice-bound for the rest of the year.

AK-KO-A, WHOSE NAME MEANS "STERN OF BOAT"
This Eskimo is an Aiviligmiut native from Repulse Bay

Much of interest centers around Norman. Not only is it the trade center of a large and productive district, but the scenic and mineral resources are also outstanding. A few miles from the settlement lie lignitic coal beds of doubtful commercial importance but spectacular, having burned continuously at least since the first exploration of the river by Mackenzie in 1789. To the north of the post lies a prominent mountain known as Bear Rock, and along the western horizon lie the bold peaks of the Rocky Mountains. The burning of the coal seams and the three peculiar red stains, probably caused by oxide of iron, which show on the face of Bear Rock, have given rise to a typical Indian legend.

Many years ago, according to the story, both the people and the game of this area were giants of their kind. A giant hunter armed with bow and arrow, while standing on Bear Rock, saw a colony of giant beaver in Bear River. With his arrows he secured three of these, but several of his arrows which had missed their mark remained embedded in the river bottom, with one end still showing above the water. As in all the northern rivers sunken trees are to be seen, the story-teller points out the giant arrows without difficulty. The hunter then skinned three of the beaver and spread the skins on the face of Bear Rock to dry; the blood left the three stains in the shape of the three beaver skins. Taking some of the beaver meat to the point where the coal now burns, the hunter made a fire to cook a meal, but the fire burned so fiercely that the ground became ignited and has been burning ever since.

Fifty miles below Norman there is every evidence of an oil field of economic importance, but the cost of a pipe-line or other means of transportation prohibits, for the present, its development on any major scale. It has given promise enough to suggest the establishment of a small

LOADING WOOD ON THE MACKENZIE RIVER
All the steamers of the Mackenzie burn wood, and such scenes as this are common during any trip on the river

refinery for the production of gasoline and oil fuel to supply the local demands.

Farther north the river flows through a cañon known as the Ramparts, whose white limestone walls rise one hundred and fifty feet above the water. From the foot of the Ramparts, Good Hope can be seen crowning a high point on the eastern side of the river. This settlement is sixteen miles south of the Arctic circle, and is a large and prosperous fur-trading center. It is also the northern limit of the Hare Indian nation, as at the next settlement (Arctic Red River) their language will be understood only with difficulty, that of the Loucheux tribe having taken its place.

The settlements of Arctic Red River and McPherson are the trading centers of a country entirely apart from the valley of the Mackenzie to the south. McPherson was established early in the last century, and was at one time the gateway to the Yukon valley. An eighty-mile portage across a comparatively low-lying country leads to the headwaters of the Porcupine River, which joins the Yukon at Fort Yukon. The delta of the Mackenzie marks the northeastern limits of a group of Indian tribes which spreads south and west to the valley of the Yukon.

The most northerly post on the Mackenzie is on an island in the river delta that is known as "Aklavik," meaning in the Eskimo language "where the bear abounds." Here the sun in summer is visible throughout each of the twenty-four hours, and here is another important boundary between native races—the meeting point of Indian and Eskimo. Originally this area was controlled entirely by the Eskimo, but the Indians following the white men have extended their hunting grounds to the north, and the Eskimo are gradually retiring to the Arctic coast line.

Aklavik is also the junction of two

transportation routes, one of which follows the Mackenzie valley, while the other is the ocean route from Pacific coast ports which leads through Bering Sea and along the northern coast of Alaska. Both routes have their drawbacks. The cost via the river route is excessive, and on the ocean route there is the ever-present danger of loss of both ship and cargo when rounding the northerly capes of Alaska.

The shores of Beaufort Sea are still the undisputed heritage of the Eskimo. Between the Alaskan boundary and the eastern end of the delta of the Mackenzie lie four settlements—Demarcation Point Herschel, Shingle Point, and Kittigazuit—whose inhabitants, living largely on the resources of the country, draw their harvest from both land and sea. The hills produce caribou, which mean both food and winter clothing; from the lakes and streams the natives secure fish, while the ocean supplies more fish and various kinds of seal and white whale, which solve the problem of materials for boats, tents, and footwear, and add to the food supply. While tree life is no longer in evidence, the heavy drift from the Mackenzie has stored the beaches with fuel adequate for many years to come, placing the Eskimos of this area in a different position from their brothers to the east, who are largely dependent upon sea-mammal oil for heat and light.

Eastward from the Mackenzie, the Arctic coast line is navigable for many hundreds of miles, steamboat service reaching eastward to King William Island having been maintained for some years past.

The numerous native settlements scattered along the Arctic coasts of Canada may be considered under three territorial divisions—from the Alaskan boundary to Baillie Island, from Bernard Harbor to

PLOWING WITH A DOG TEAM

The trading post at Hay River is also the headquarters of an important Anglican Mission. Here Indian and Eskimo children are able to obtain education, and here, too, the missionaries are properly proud of their agricultural success, even though their products are limited

AN ESKIMO WOMAN IN FRONT OF A SKIN TENT
In winter these people live in snow igloos, but during the short, hot summers, all snow disappears, and skin tents are used

Boothia Peninsula, and from the western shores of Hudson Bay to the Atlantic. Until the advent of the white man, a barrier appears to have existed between the natives of Baillie Island and Coronation Gulf, and another, though not so absolute, separated the residents of Boothia Peninsula from those of Hudson Bay.

Both the eastern and western groups received their first impression of civilization from the whalers, while those of the central areas are only now drawing their first knowledge of the world from the fur traders from the south. The influences prior to the white invasion are still stamped on all, in clothing, accoutrements, and home life. These differences are, however, entirely regional; the language throughout the Eskimo world is basically the same; and a study of the folklore proves the common origin of the Eskimo people from Siberia to Greenland.

The Government of Canada is confronted with a complex problem in the administration of the Far North, but, in so far as it is possible, the various situations have been met as they have arisen. Communication is maintained by a well organized mail service and an efficient system of wireless telegraphy operating stations at Edmonton, in Alberta; at Fort Smith, Resolution, Simpson, and Aklavik in the North West Territories; and at Herschel Island, Dawson, and Mayo in the Yukon. Schools and hospitals are subsidized, relief is given to the sick and destitute, game sanctuaries are maintained where wild life is molested by no one, and many thousands of square miles of the territory are set aside as hunting and trapping grounds for the sole use of the native population. Government offices are maintained within the Territories, and law is enforced by Canada's efficient Royal Canadian Mounted Police.

Each year, as more complete information becomes available, the picture of the Northland, as it will appear in the not distant future, grows in interest. Today the Canadian Government subsidizes the Territories, not altogether in a spirit of philanthropy but as an investment from which it will draw ample dividends. The value of the natural resources of the country is undoubted. To develop them to the best advantage the coöperation of the native population is most essential, and the expense incurred in their care and improvement will be amply repaid.

A JUNGLE RIVER JOURNEY

Up the Amazon and the Rio Negro to the Strange Stream that Connects the Amazon Valley with That of the Orinoco.—The "White Indian" from the Padamo River.—The Comforts and Discomforts of Travel in the Interior of South America

By HERBERT SPENCER DICKEY

A LINE of really palatial steamers connects Pará with the towns of the upper Amazon. Screened staterooms with comfortable beds and running water, a large open-air dining saloon on the after deck, decent meals, good service, and a refrigerating plant, help to counteract the effects of the heat and the depredations of the ravenous mosquitoes and gnats that come aboard whenever the ship stops for wood.

Heavily subsidized by the Brazilian Government, the Amazon River Steam Navigation Company manages to run, provide us with comforts, and charge us the ridiculously low price of $12.50 for the thousand-mile journey from Pará to Manaos, meals included. With that we are content.

The Amazon color scheme may be said to be that of amber and emerald. The former is provided by the stream itself, which derives this color from the tons of slowly precipitating silt which are washed daily from the banks. The latter is provided by the dense forest which covers the low-lying land on either side of the river.

All the low land is subject to inundation at some time. The very low land, known as the *igapó*, is flooded with the slightest rise of the river. Higher land, the *vareza*, is flooded only when the river is very high. The highest land, the *terra firma*, is never inundated. It has a foundation of clay or rock, and here the occasional towns and villages, which are to the gigantic forest as a toy boat is to the ocean, have their being.

Tourists are invariably disappointed with the first thousand miles of the Amazon, which is as far as their ships go. With all the effort Nature has made to show what she can do in the way of flora, she has been decidedly remiss in the question of fauna, and has apparently made no attempt whatever to make the tourist literature come true. Monkeys do not spring from tree to tree, throwing coconuts at the delighted passengers, jaguars do not chase tapirs through the forest in full sight of the vessel, and most of the giant saurians nosing along the banks turn out to be drifting logs when the binoculars are turned on them.

Mammalian life is abundant only in the forest far from the river banks. There are found peccaries, tapirs, monkeys of a dozen varieties, small deer, jaguars, and several species of rodents. Even birds are rarely seen along the river banks. An occasional heron, the beautiful but not edible cigana, and, at nightfall, flocks of parrots and paroquets are the only instances of life in motion that the steamer traveler ever sees, if we leave the insects out.

Many insects, however, come aboard at every landing. Besides the gnats and mosquitoes, there is another troublesome flying creature—the "pium"—which is exceedingly active. It alights on its victim, finds a suitable spot, bites, and fills with blood. Then it sails sluggishly away like a small red balloon. A hard point is produced where the insect has bitten. In the center of this swelling is a round point of hemorrhage. The itching

MANAOS

Situated near the confluence of the Rio Negro and the Amazon, this city now has about 25,000 inhabitants. Formerly, during the height of the rubber "boom," Manaos was very active and wealthy, but since the collapse of the rubber industry in the Amazon valley, life seems almost to have left the place

produced is intense, but it does not last long. A score or so of these bites, however, can change an otherwise happy life into one of woe.

These do not by any means exhaust the insect possibilities of the Amazon region, but one must disembark to enjoy the others. The *tucandera*, a large, fierce ant, lives but a few steps away in the forest. Of all insects his bite is the most painful.

A little red fellow called the fire ant, graphically and advisedly from the nature of its bite, brings out the worst in one. Fire ants have been known to invade villages and drive the inhabitants away.

The most interesting of all ants is the *sauba*, called also the umbrella ant. The *sauba* ants march along in bands, carrying bits of leaves, fifteen or twenty times their own size, over their heads like umbrellas. These bits of leaves are carried to the nests where, after being chewed, they form a medium for the growth of a fungus on which the *saubas* live.

As the *saubas* have a special penchant for anything planted, spurning the millions of tons of wild foliage so easy to acquire, they have decided the agricultural problem on the Amazon by making it very nearly impossible for the inhabitants to practice agriculture. These ants may demolish a plantation of banana trees in a single night.

Flying ants drop down on the head of the forest stroller and inject what seems to be sulphuric acid into his ears. He picks a flower and little black ants swarm over his hands. He leans against a tree and a myriad light-brown ants make merry on his neck and explore the region inside his shirt.

The folk who live along the lower Amazon, excepting those who have the clean streets and decent appearing houses of the larger towns to frequent, are a miserable, malaria-racked lot. No one is able to do a really hard day's work. They live mostly in bamboo structures mounted on piles.

Around these dwellings grow the few coffee trees, cacao trees, and plants of manioc which the *sauba* ants have left.

Manioc, or cassava, is the staple food. It is eaten fried and boiled and from it is made that uninteresting food, "farinha." The roots of manioc are washed and peeled. Then they are grated on a utensil made of wood inset with numerous sharp-pointed pebbles. The pulpy product is again washed, and the liquor, which contains a poisonous substance is expressed. The dry pulp is now baked, during which process it disintegrates into hard grains that taste more or less like pieces of cork.

The Amazonian cannot get along without his "farinha." He puts it into soup, when he has any, mixes it with the meat of the turtle, and eats it plain, throwing it with great dexterity from the plate on the table to his mouth with a graceful flip of his spoon.

The inhabitants of the larger towns along the river are not as forlorn as the shack dwellers. Those who live in the cities lead comfortable lives. How most eke out existence is a problem, but they seem always to have enough money to buy white suits. Arrayed in these they sit in comfortable chairs before the bars, watching the Portuguese work, and discussing politics.

Ninety per cent of the conductors and motormen on the Manaos trams are Portuguese. Ninety per cent of the longshoremen, boatmen, and fishermen are of the same race.

Manaos is the pride of the Amazon. Santarem, Obidos, and Itecoatiara, smaller cities on the road from Pará, have well built churches, flower-planted public squares, and little else to excite one. Manaos, however, which lies not on the main stream but nine miles up the Rio Negro, is a substantial modern place.

It was formerly known as Barra, and really found a place on the map when the

THE OPERA AT MANAOS

This million-dollar structure was built at the height of the city's period of prosperity. With the slump in the rubber business, this handsome edifice was closed, and now stands like a silent sentinel watching over the almost lifeless town

SUNSET ON THE ORINOCO RIVER
This scene is near Ciudad Bolivar, about two hundred miles upstream from the river's mouth

capital of the State of Amazonas was moved here from Barcellos in 1807. During the rubber-boom times it progressed amazingly, and in a few years it had developed from a ramshackle sort of frontier town into a place of luxury. About everything needed for a luxurious existence could be found there. A million-dollar theater, which soon closed its doors as the European artists, imported to entertain the inhabitants, died from yellow fever, barber shops reeking of the Orient, perfumery and lotion loges in profusion, ice-cream and candy parlors, scores of bars most gorgeously gotten up in gilt and plate glass, and asphalted streets over which hummed motor cars of the most expensive European makes—this was Manaos.

With the slump in rubber, due to the progress of the Near East plantations, which, ironically enough, had their being in shoots taken from this same Amazon, came bankruptcy to many, but disillusionment to only a few. The bars are closed, the expensive motor cars have disappeared from the streets, but the rubber exporters, those who retain a little credit, still hang on. The rubber collectors, who have no other industry to turn to, still struggle with their product, which today is worth about twenty cents a pound. The Amazonian public was undoubtedly ruined by the prosperity of the boom days. Almost all of the survivors believe that those days will return. The dubious ones moved away long ago.

Manaos, with all its modern buildings, its electricity, its well paved streets, is dead. And the million-dollar theater stands over it like a monument.

It is customary to speak of Manaos as the Jumping-off-place. Travelers to any of the upper reaches of the numerous tributaries of the Amazon are warned that once Manaos is left behind, civilization ceases, comforts are no longer procurable, and that one is up against the stark, stern realities of primitive existence.

It is true that the S. S. "Inca," which

makes a monthly trip up the Negro, has seen better days. Her engines wheeze a bit and her stern paddle wheel hits the water somewhat unevenly. But she is a clean ship, her cabins are roomy, the service aboard is excellent, and the food, for the locality, beyond criticism. A large refrigerating apparatus adds to the comfort of all and, on occasion, to the gaiety of many.

A rather intimate acquaintance with the tributaries of the Amazon, gleaned in more than twenty years of traveling their courses, brings me to the opinion that the Negro is the saddest of them all.

The Morona, Santiago, Tigre, Napo, to name a few of those I know well, never were civilized, never got beyond the stage of thatch-roofed houses situated distant one from another. The Rio Negro, on the other hand, had ambitions. The early Portuguese settlers along its banks counted masons, carpenters, and others artisans among them, and these employed their arts in erecting houses meant to last for centuries. Edifices of brick and stone were built in the most incredibly inaccessible places. When the settlers found that even canoes could not get anywhere near these places during the dry season, they moved. All that remains today of all this wasted effort are a few piles of cut stone lying at different spots along the river's bank, and some weed-covered piles of brick on the outskirts of what today are squalid villages.

The lower four hundred miles of the Negro seems like an enormous lake. The fall is very slight, the river is exceedingly broad, and there are numerous islands. Santa Izabel, five hundred miles from Manaos, is the limit of steam navigation. Just below this place the river changes its character. It becomes narrower, islands are less numerous, and what there are have rock foundations. The current becomes swift. Instead of the interminable forest shown lower down the stream, one sees river banks composed of granite.

Two kerosene motor launches meet the

TRANSPORTATION METHODS ON THE RIO NEGRO

The motor boat has a barge lashed to each side, and thus makes its slow way upstream. Doctor and Mrs. Dickey traveled with this outfit from Santa Izabel to Sao Gabriel—a distance of about 150 miles

RIVER TRAVEL ABOVE SAO GABRIEL
Doctor and Mrs. Dickey with their native canoe-men on the Rio Vaupes, in Brazil, not far from the Colombian border

"Inca" at Santa Izabel, and conduct passengers and freight to Sao Gabriel. As we were ushered aboard a lighter attached to one of these, we saw that "the stark, stern realities of primitive existence" had not, as yet, been reached.

A nice clean cabin with plenty of room for two hammocks, our chairs and tables, welcomed us. A meal composed of fresh turtle soup, fried "piranha"—the fish with the terrible reputation as a man-eater—stewed manioc, cheese with guava jelly, and delicious black coffee didn't seem stark or stern.

Six rapids, all with awe-inspiring reputations, were passed in five days. We heard about them, invariably, some time after we had passed them. Then, on the sixth day, we came to the father of them all, the Rapid of Camanaus. Our launch tried it first with one lighter. After buzzing about a bit without making an inch of headway, we fled ignominiously to shore. Then, with us aboard her, the launch tried it alone. Waves broke over our bow, whirlpools twisted us, but we made it. Then we had to wait while the launch brought load after load from the lighters. The empty lighters were then towed through the rapids by the Indian crew, who swam, carrying the tow rope.

Sao Gabriel is only 225 feet above sea level, and it is hot. A mission there contains more than a hundred sweating Indian boy and girl students, who are able to continue their pursuit of knowledge only by the aid of numerous baths a day. It is no place for a white man to linger long. Luck put us in the way of acquiring a small launch, and hastened our departure.

The launch owner, a relic of the "good times," admitted that the engine of the launch had not been cleaned in nine years. "But," said he, "she hasn't stopped yet."

Six hours above Sao Gabriel the River Vaupes enters the Negro. Along the banks of this river live many tribes of Tokano Indians. They were interesting individuals originally, but the influence

of the missions has caused them to lose most of their arts and primitive customs. The excellent pottery they once made has given place to enameled ware from Hamburg, their picturesque adornments have been supplanted by blue dungarees from Manchester.

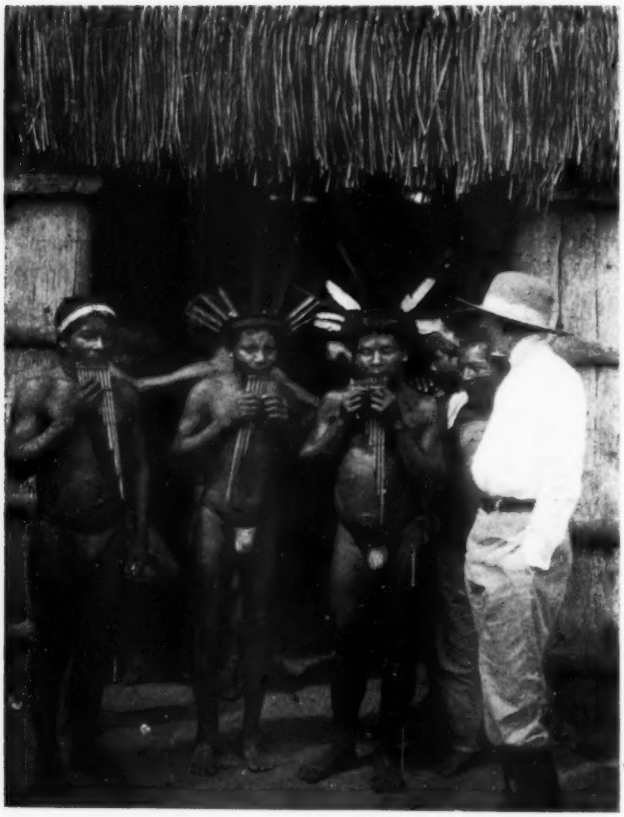
However, under proper persuasion of a monetary character, they will doff the habiliments of civilization and don again the feather headdresses and grass tails they used before the padres came. Their lives are spent in little work and much feasting. Feasts are called "casheerees." Little "casheerees" are given in celebration of an extraordinary catch of fish, an especially good crop of "pupunha" nuts, or for no reason at all except to get intoxicated and have a good time. The big "casheerees" are given when some boy attains puberty, in honor of the "Juruparee," or tribal devil, and in celebration of the legendary slaying of "Bucia Wassu," the Great Serpent.

Space prohibits my going into the mattter of these "casheerees" to any great length. I will speak only of the one dedicated to the slaying of the Great Serpent.

Bucia Wassu, according to the legend, came up from the sea, made his headquarters at the Rapids of Ipanoré on the Vaupes, and succeeded in eating all the fish in the region, bringing famine to the Tokanos. The Tokanos, through their "Payay," or medicine man, managed to lure Bucia Wassu ashore by means of a beautiful female serpent (really the medicine man in disguise). The Indians fell upon Bucia Wassu while he was engaged in the pursuit of romance, and slaughtered him.

This, however, did not stop the trouble. Bucia Wassu had made his arrangements before coming ashore, and the Tokanos were astonished one day to see two large serpents, recognizable as a son and a daughter of Bucia Wassu, swimming along near the bank. The offices of the medicine man were again employed. He had

LUNCH WITH A NATIVE AT MALOKA CIGARRO
The Indian is a Tokano, a tribe that inhabits the district near the Vaupes River



"PIPES O' PAN" AMONG THE TOKANOS
The three bedecked Indians are playing their reed pipes for Mrs. Dickey in order to illustrate phases of the dance of "Bucia Wassu"

communication with the serpents and returned with the glad tidings that everything would be all right within a few days, for the female serpent—a beautiful white one—had assured him that at the first opportunity she would kill her brother. The brother, she told the medicine man, wished to follow in his father's footsteps, but she was friendly to the Tokanos and would see that no more fish were destroyed.

Everything turned out as guaranteed by the white serpent, and the incredulous may see proof of this in the deeply chiseled pictures on the rocks at Ipanoré. Among ten sculptured representations of serpents, manatees, and various fish, is one representing Bucia Wassu, traveling the primrose paths, and another of his daughter slaying her brother.

The White Serpent still appears every year to the Tokanos. To our uneducated eyes she seems to be nothing but a long line of white spume which floats down the stream when it is in flood, but the Tokanos know better.

A celebration of the death of Bucia Wassu then, is an excuse for a "casheeree."

With bodies painted in red, with feather headdresses and grass tails waving, with nutshell anklets rattling, the males of the Tokano tribes gather in the interior of the enormous thatch-roofed "maloka," or tribal dwelling place, to drink and dance. Dancing is intermittent and consists of a shuffling back and forth in a circle. Drinking is continuous. The drink is "casheeree," which gives the feast its name. It is made from the fermented juice of the "pupunha" nut, manioc, pineapples, or any other fruit or vegetable at hand. The fermenting medium is usually saliva.

After a high degree of alcoholic saturation is attained, a number of Indians, clasping each other's bodies, writhe like a serpent on the floor, while others attack them with clubs and spears. Thus is Bucia Wassu killed several times a year. Unprintable orgies follow and continue as long as the "casheeree" holds out.

Four days' run from the mouth of the Vaupes brought us to Cuchuy, the last outpost of Brazil. A few hours more brought us to San Carlos, Venezuela.

Now we began to see another class of

Indian—Maquiritaris—folk who have become civilized without benefit of clergy, and are the hardworking standbys of the few rubber collectors left in the region.

The Casiquiari, that remarkable stream which does a right-about and flows from the Orinoco into the Rio Negro (or Guainia as it is called here) joins this river two hours above San Carlos. It is at its mouth a black-water stream. Two days farther up, its waters become muddy, the color of the Amazon, and with this metamorphosis come our old friends the "piums." They are the most persistent, most virulent "piums" one could wish to feel. But leaven is here in the almost incredible numbers of beasts and birds that live their own lives with little to disturb them. For the Casiquiari, never a metropolitan center, has today but four occupied houses along its course of 180 miles, and unmolested otters, in bands of six and more, play about our vessel every day of the trip. Tapirs, each with his proboscis tightly retracted, swim across our bows,

TRADING A BOX OF MATCHES FOR A PAROQUET

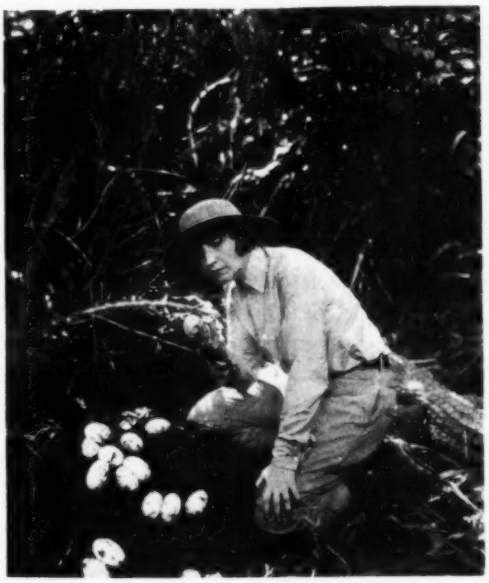
These Tokanos have exaggerated their hats almost as if they were trying to offset the limitations of the rest of their costumes

and oh! that the tourist people could visit here, for monkeys—little gray ones, big red ones, others with black hoods—really perform acrobatic feats in the trees and refrain from bombarding us with coconuts only because no coconuts are available. Macaws, parrots, and paroquets shriek, and show brief glimpses of gaudy plumage. Egrets skim past and land ungracefully on neighboring sand banks. A dozen varieties of kingfishers, some with the most glorious colorings imaginable, watch us with their beady, staring eyes, as we pass by.

And as there are birds and beasts, there are fish: "tucunaré," "pirahiba," dolphins, even.

The trees grow close to the water's edge on the Casiquiari, and most of them, besides the usual tangle of lianas, seem to bear orchids of the most gorgeous hues. Purple is the predominant color, but there are others—orange, yellow, and white.

Our sputtering, limping, dirty motor had brought us about half way through



GATHERING CAYMAN EGGS

This "nest" was located at some distance from the river, and its guardian attempted to attack Doctor and Mrs. Dickey, with the resul that it had to be shot. The cayman is a crocodile

PUERTO AYACUCHO
A spot at the lower end of the Maipures Rapids in the Orinoco River

the Casiquiari, at the rate of fewer than twenty miles a day, when we came upon the object of our quest, or as near to it as will ever be possible, I think. For five days we had passed by masses of tangled foliage, with occasional widely separated houses with never a soul in them. Then we came to a collection of ramshackle huts. The place seemed deserted at first, but finally we saw a thin wisp of smoke climbing up through the roof of one of the huts, and presently we heard sounds as of someone in pain. Inside, stretched out in a hammock, was a naked, very light-colored Indian. One of our crew had a smattering of the Guaharibo tongue and was able to communicate with the sick man, who was of that tribe.

He had been captured with six others, he said, by Venezuelan rubber hunters on the Padamo River, and had been brought down the Orinoco, to where the Casiquiari flows out of that stream. He, with his companions, had one night stolen a canoe in which to escape, but had been unable to find paddles. Knowing that any attempt to pole *upstream* back to the Padamo would be a slow process that would result in capture, and that a trip *down* the Orinoco would bring them to the region of civilization which they were anxious to escape, they decided to go down the Casiquiari—the last place pursuers would think of looking for them, as it took them away from home—and make their way back overland to the Padamo—a long, hard journey but a safe one. His companions had carried out this plan, but the sick man had developed malaria and had been compelled to stop here at "Capibara." He said, also, that Whites were no novelty to him as he had been one of the attackers of the Rice Expedition several years ago, although he admitted that he hadn't been able to get as close to them as he was to us.

This man's eyes were dark brown, not black, His hair had a coppery tinge, and his body coloring corresponded to Number 23 on the Broca Chart, which is a Mon-

golian coloring. His eyes were frankly Mongolian in shape.

That was our "white" Indian and interesting enough, in a way, but, some of the things he told us were more interesting still. He told us that his tribe numbered six times ten fingers, that they lived in large, oblong houses surrounded by plantations of sugar cane, manioc, bananas, pineapples, and corn, that many of his tribe were lighter in color than he, and that he had a brother who was as white as a white man! We couldn't shake him in that story. No, his brother was not white like a Brazilian or a Venezuelan, he was as white as we.

Our first reaction was an immediate and insistent resolution to visit the Rio Padamo and bribe, cajole, or otherwise persuade the sick man's brother to accompany us back to the United States. We already envisioned the reception we would receive if we returned accompanied by so remarkable a find. But better counsel prevailed, as it has an awkward way of doing at the potentially thrilling moments and, summing up, we found several insuperable obstacles in our way:

(1) None of our present crew would accompany us to the Padamo.

(2) It would be impossible to get anyone to accompany us, for our arrival among the objects of our search so soon after a raid by rubber hunters on their camp, would undoubtedly cause the Guaharibos to fire on us without going through the formality of examining credentials.

(3) We had just enough fuel to get us to the Orinoco and send the launch back home. So, we didn't go.

Passing out of the Casiquiari, we forsook the launch and proceeded by easy stages and a series of canoes—there was no trouble in getting crews to go *down* stream—to where we found launch navigation again. We passed over two portages on the way. One we passed by ox-cart, the other we crossed quite luxuriously, speeding over its eighty kilometers in a motor car. We had contact with a number of tribes. More Maquiritaris and then the Guahibos—hairy-bodied fellows with chin beards like old-time Kentucky colonels, but, withal, one of the lowest tribes culturally in all South America. They are too indolent to make hammocks, which are so common in this land,

USING THE "BROCA COLOR CHART"
By making use of this chart, accurate records of the skin-color of natives is possible

and they sleep where night overtakes them, in weird contrivances made of green vines which very often dry and break before dawn, thus rendering the breakfast-bell a superfluous article in the Guahibo household. And they have strange tastes, these Guahibos. Not only do they eat any kind of food they are fortunate enough to be able to beg or steal, but, according to the engineer in charge of the construction of the road across the Maipures portage, they go farther than that. Two Guahibos, this man told us, stole ten gallons of motor lubricating oil from the garage and were subsequently found giving a *fête champêtre* to a dozen companions in which the *pièce de résistance* was the motor oil mixed with cassava bread.

The Piarroas, found also in the vicinity of Maipures, are a cleaner lot. They wear about their waists, a hammock-like contrivance of white cotton cloth, which they weave themselves, but that, excepting a remarkably economical burial system, is one of their few distinguishing characteristics. When a Piarroa develops a cold, malaria, or what not, consultations of specialists or medicine men are not held, no drugs are given. The patient is expeditiously bundled off to a cave, where, accompanied by a jar of water and a basket of food, he either gets well and emerges, or dies and remains.

At Ciudad Bolivar our long trip ended after nine months of jungle wandering. It is true that one need not leave all the comforts of civilization in order to reach far interior points of South America, but there are many districts that civilization does not touch. Thus, on our way in, we had finally left the very last traces of civilization behind, and now we were glad, at last, to leave the wilds to the wilds, and to return to the world from which we had come, for the South American jungle, fascinating though it can be, is not perennially attractive to those who enter it.

A TOKANO

Photograph by James P. Chapin, 1921

THE MER DE GLACE, FRANCE

The Mer de Glace is one of four glaciers of Mont Blanc descending into the valley of Chamonix

LIVING GLACIERS

By CHESTER A. REEDS

Curator of Geology and Invertebrate Paleontology, American Museum

GLACIERS afford one of the most magnificent scenic displays to be found on the earth. In our temperate zone they are associated with snow-capped peaks, rugged mountains, fair lakes, and valleys of exquisite beauty.

Glaciers originate in fields of perpetual snow, and creep down valleys as slow-moving rivers of ice to feed high waterfalls, roaring mountain streams, and nestling lakes.

In certain places man has added a touch of picturesqueness to the labors which Nature has so admirably performed. He has climbed the high mountains and laid out roads through the passes. He has established shelters like the Hospice of St. Bernard. He has bored tunnels of astounding length through solid rock, that these glacier fields might be reached more easily, such as the Eismer station near the crest of the Jungfrau in Switzerland. In other places he has established funicular railways from valley to peak, that Nature's wonderland of snow and ice may be viewed more advantageously. In the lower valleys beside charming lakes, and on the great heights beset with clouds, he has placed chalets, toylike villages, and well equipped camps and hotels. Today people go to Switzerland, to Yosemite Valley, to Banff, to Seattle, and to Glacier National Park, to see the wonderful scenery and enjoy the sport and adventure which Nature has provided.

Polar and sub-polar glaciers are not confined wholly to high mountains, for they also cover vast land areas and reach the sea. In such regions, the glaciers and the attending climatic conditions retard the extensive development of railways, and other modern means of travel. It should be recalled, however, that several railroads have been built through the snow and ice fields of Alaska, and one of them, along the Coppermine River, has its road bed laid for five miles upon the terminal margin of the Allen glacier. It is true

that since the advent of the aëroplane and the dirigible balloon, the North Pole and many miles of frozen deserts have been traversed by air ships, but fogs, violent storms, unknown landing places, and the absence of suitable fuel make such attempts at exploration hazardous undertakings unless well organized. The outfitting and the explorations of various polar expeditions, the organization of mountain clubs and ice sports in Europe, America, and New Zealand, have brought glaciers within the realm of popular interest.

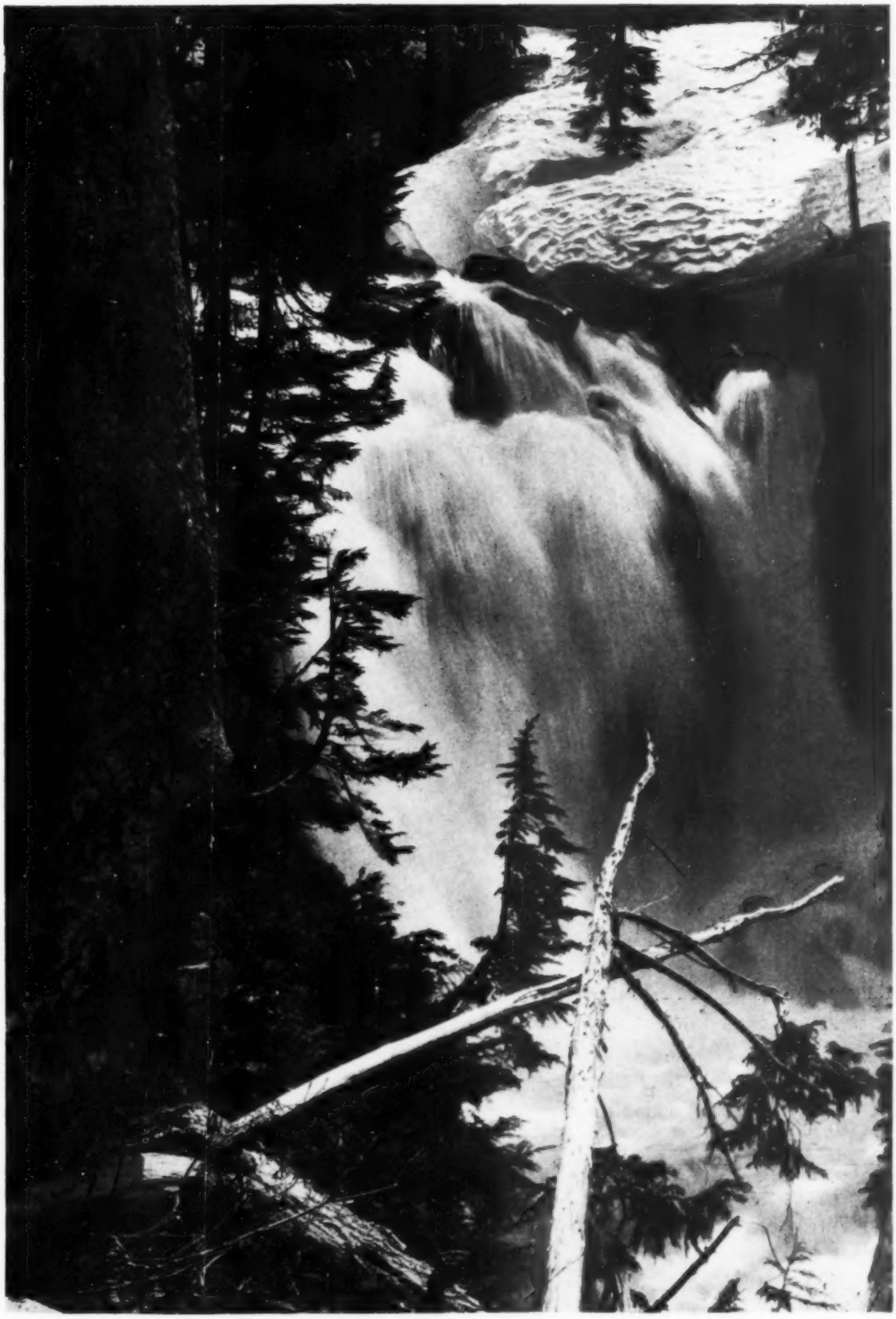
It has not always been so. Up to the end of the Eighteenth Century it was not an uncommon belief that mountain highlands were bewitched. Because of this, the Alps mountains, the modern playground of Europe, were unexplored. It was Horace B. de Saussure (1740–1799), who, with his colleagues, removed the prejudice against the "Montagnes Maudits" and awakened a feeling of enthusiasm for the infinite wonderland of beauty and delight in the higher altitudes of the Alps. Through the example set and the prizes offered by de Saussure, Mont Blanc was first climbed in 1786 by the guide J. Balmat. In succeeding years this and numerous other difficult Alpine peaks were scaled by de Saussure and his exploring parties. He may be regarded as the father of mountain-climbing.

Popular interest in the exploration of the Alps, once having been aroused, has continued down to the present day. In 1837, Louis Agassiz, from his study of the Alpine glaciers and the erratic blocks of rock in the Jura Mountains, anticipated, in a letter to the French Academy, his theory of a former "Ice Age" which he announced more fully in monographic form in 1840 and 1847. These papers, together with that of Jean de Charpentier in 1841, created a deep interest in glaciers, not so much because of the Alpine glaciers themselves, but because for the first time it afforded a satisfactory explanation of the erratic bowlders, which are found strewn over the Alpine foreland, the north German plain, the Scandinavian peninsula, the British Isles, Canada, the northern United States, and many other parts of the world. This was a brilliant generalization.

Subsequent studies by individual geologists and governmental organizations in many lands have confirmed the theory that there was not only an extensive Ice Age in comparatively recent times, but evidence in the rocks points to the development of other glacial periods at widely separated intervals in geologic time. Recent studies in the Alps, particularly those of Penk and Brückner in 1901–1909, have revealed that the last Ice Age was not a single cold period, but that it was a multiple affair, with four periods of glaciation known as the Günz, Mindel, Riss, and Würm stages, separated by long interglacial periods. The numerous lakes of Canada, Maine, New York, Michigan, Wisconsin, Minnesota, Argentina, Finland, Sweden, and Switzerland, were developed by these great moving masses of ice, and hence are of glacial origin.

Present-day glaciers are formed on those portions of the earth's surface that are permanently above the snow-line. This line varies locally, even in the same latitude, being in some places higher than in others, but generally speaking, it is of the nature of an elliptical surface surrounding the earth with its longest diameter in the equatorial belt, and its shortest in the polar regions, where it touches sea level. From the Arctic to the Antarctic circles this cold surface rises upward in a broad dome 16,000 to 18,000 feet high over the tropics, and cuts a number of lofty peaks and mountain ranges whose upper levels receive all their moisture in the form of snow.

Glaciers consequently have a wide distribution. They occur in Greenland,



THE TERMINUS OF A GLACIER ON THE SLOPES OF MOUNT RANIER

Twenty-four glaciers appear about the snow-capped peak of Mount Ranier in the state of Washington. As these ice masses move down the mountain-sides to elevations 4500 and 5500 feet above the sea, their terminii melt to form the sources of numerous mountain streams. Here various species of evergreen trees of large size grow in close proximity to the ice front

Photograph by Rollo H. Beck

A GLACIER OF TIERRA DEL FUEGO ENTERING THE BEAGLE CHANNEL, CHILE

The highest elevations in Tierra del Fuego are the snow-capped peaks of Mount Darwin and Mount Sarmiento (7200 feet), which contain glaciers of greater extent than Mont Blanc of the French Alps. Glaciers are very abundant in Tierra del Fuego, with a snow-line varying in height from 4900 feet to 1600 feet. Beagle Channel, an east-west passage at 55° S. latitude, was named after the "Beagle," the ship in which Charles Darwin made his memorable voyage through these waters in 1832

which is covered with an entire sheet of ice, except for the marginal ribbon of land, which is usually from five to twenty-five miles in width with a few places where the edge of the ice is sixty to one hundred miles from the shore. Ice caps and valley glaciers are found in Baffin Land, Ellesmere Land, and a few of the islands to the westward, in Iceland, Norway, Sweden, Spitzbergen, Franz Joseph Land, and Novaya Zemlya. Glaciers of the Alpine or valley type occur in the Old World in the Alps, Pyrenees, Caucasus, Himalayas, Tian Shan and East Sayan mountains of Central Asia, and the high peaks on the equator in east central Africa.

In North and South America glaciers occur in the high mountain ranges facing the Pacific Ocean. They are most fully developed in Alaska, and in Chile and Argentina, where they face moisture-laden westerly winds. In New Zealand numerous lakes, waterfalls and glaciers, one eighteen miles long, are to be found in the south island. In the south polar region, the Antarctic continent is not only covered with a great ice cap, but it affords the largest glaciers in the world.

While the facilities and accommodations for seeing the 1155 glaciers of the Alps are unsurpassed, it should be noted that most of the glaciers are small, some of them being only a few hundred yards in length. The largest of these is the Aletsch, which is ten miles long, and with its snow field, fifteen miles. It is about a mile wide, and terminates about 4000 feet below the snow-line, which is at an elevation of 8500 feet. The average length of the better-known glaciers of the Alps is from three to five miles, but the greater number of them are less than a mile in length and considerably less than a mile in width. Little is known as to their

thickness, but it is estimated that they attain a depth of from 800 to 1200 feet. As to the rate of motion there is a considerable difference. The smaller ones may be quiescent, while the larger ones move at the rate of several feet a day. The Mer de Glace, one of the largest, was observed in 1912 to have a daily rate of 18 inches near the sides, much less at the margins, and about 27 inches in the central axial portion.

Large and small valley glaciers of the Alpine type are also found in the Caucasus mountains where the snow-line appears at 8500 feet at the western and 14,000 feet at the eastern end. Numerous large valley glaciers occur in south central Asia, in the Himalayas, and the Tian Shan Mountains, with a snow-line at 16,000 feet at the south and several thousand feet higher along the northern margins. In the Himalayas the Siachen or Rose glacier, which is 45 miles long and 2½ to 2¾ miles wide, is the longest glacier in Asia and is comparable in length with the large glaciers of Alaska. In the Tian Shan Mountains the largest glacier is the Imylchek, which is reported to be 40½ miles long and 1¼ to 2¼ miles wide.

The glaciers of Alaska are the largest in the world except those in the polar regions. The broad sustained mountain range bears thousands of them; a few hundred have received names; some have

THE FRONT OF TUMBLING GLACIER, MOUNT ROBSON, BRITISH COLUMBIA

About ten miles north of the Grand Trunk Pacific Railway there is a climax of snow and ice centering around Mount Robson (13,068 feet), the highest summit of the main range of the Canadian Cordiliera. The mountain is clad with snow and ice, and mighty glaciers fall from great heights on every side. On the north, Tumbling Glacier falls more than 5000 feet to Berg Lake to bury its nose in the waters of this beautiful tarn. Great blocks of ice, which break off frequently with reports like thunder, fall into the lake to produce waterspouts and minature icebergs

Photograph by H. E. Anthony

A DISTANT VIEW OF THE SNOW-LINE ON MOUNT COTOPAXI, ECUADOR

In Ecuador the active volcano Cotopaxi (19,613 feet), which is less than one degree south of the equator, is not only snow-capped, but it supports glaciers. It is one of 22 high peaks almost in sight of one another, which rise along the eastern and western margins of the Andean Cordillera in Ecuador. Their conical summits culminate far above the line of perpetual snow which, in this region, is about 15,750 feet above the sea

been partly mapped, but many have never been seen. Beginning near the 63d parallel, they increase in size and depth until the lofty region between Mount Fairweather and Mount St. Elias is reached, where a considerable number discharge into the waters of the ocean. Between latitude 56° and 60° there are probably five thousand glaciers, hundreds of large size descending through the forests, with more than twenty-five discharging into the sea. Icebergs are given off from them, but due to the intricate labyrinth of channels and high-walled fiords, few of them reach the open ocean before melting.

Through British Columbia, the broad mountain chain is generally glacier-bearing. The upper branches of nearly every one of the main cañons are occupied by glaciers, which gradually diminish in size southward. In Washington and Oregon groups of active glaciers still exist on all of the highest mountains, particularly on Mounts Jefferson, Adams, Saint Helens, Hood, Rainier, and Baker. Of these, Mount Rainier is the highest and iciest. Twenty-four glaciers from seven to fifteen miles long radiate from its snow-covered cap to form the sources of the principal streams. One of these rivers, arising from the snout of the longest glacier at an elevation of 4500 feet, pours a stream opaque with glacial mud into the head of Puget Sound.

In California there are about sixty-five small residual glaciers in the Sierra Nevada Mountains, between latitudes 36° 30′ and 39° distributed singly or in small groups on the north sides of the highest peaks at an elevation of about 11,000 to 12,000 feet above the level of the sea—all remnants of the grand glaciers that once covered the range. Between latitudes 37° and 38° they form the highest sources of the San Joaquin,

Toulome, Merced, and Owens rivers. Mount Shasta, near the northern boundary of California, has five shrinking glacier remnants, the largest about three miles in length.

In central Mexico near latitude 19° there are three high extinct volcanic peaks, namely: Orizaba, 18,209 feet, Popocatapetl 17,888 feet, and Ixtaccihuatl, 17,343 feet, which are snow clad, with the snow-line appearing at about 15,000 feet.

In South America there are many glaciers in the Andes even beneath the Equator itself; and though these glaciers are small and mostly confined to the highest peaks, toward their southern end along Smyth Channel and in the Strait of Magellan they are large and flow far down the slopes, and at several places enter the sea.

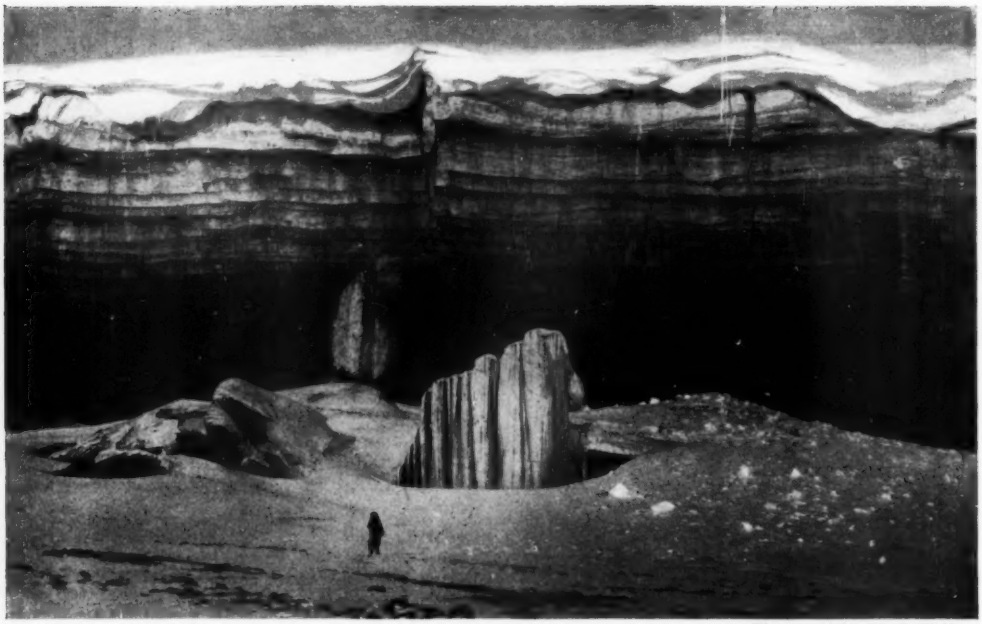
The snow-line of the Andes is highest in parts of Peru and Bolivia, where it lies at about 17,500 feet. Its general elevation from the extreme north to Patagonia is 14,500 to 16,500 feet, but along the Patagonian frontier it sinks rapidly, being 5000 feet in central Chile, 2300 in southern Chile, and 1600 in Tierra del Fuego. The snow-line is generally about 2500 feet lower on the east than on the west side of the mountains except in southern Chili where it is lower on the west side.

In Antarctica snow and ice cover the land so completely, and to such great thickness, that it has been impossible to determine whether it is one great continent or a series of islands covered with great glaciers. In numerous places glacier tongues and shelf-ice appear about the margin of the continent. Furthermore, a zone of pack ice about ten degrees in

Photograph by H. E. Anthony, 1923

A TROPICAL GLACIER ON THE SLOPES OF ANTISANA, ECUADOR

Mount Antisana, like Cotopaxi, is one of the high peaks of the eastern range of the Andes in Ecuador. It is less than half a degree south of the equator, and has an elevation of 19,335 feet above the sea with a snow-line at approximately 15,750 feet. All of the higher summits of Ecuador have true glaciers. The largest glaciers are found on Antisana, and Cayambe (19,186 feet), which has twelve, and Chimborazo (20,498 feet) the highest mountain of the western range, which has eleven



Photograph by W. E. Ekblaw

UMANAK GLACIER, NORTH STAR BAY, GREENLAND

The seasonal deposition of snow on the Greenland ice-cap is apparent from the horizontally banded lines of stratification shown in this view

Photograph by E. O. Hovey

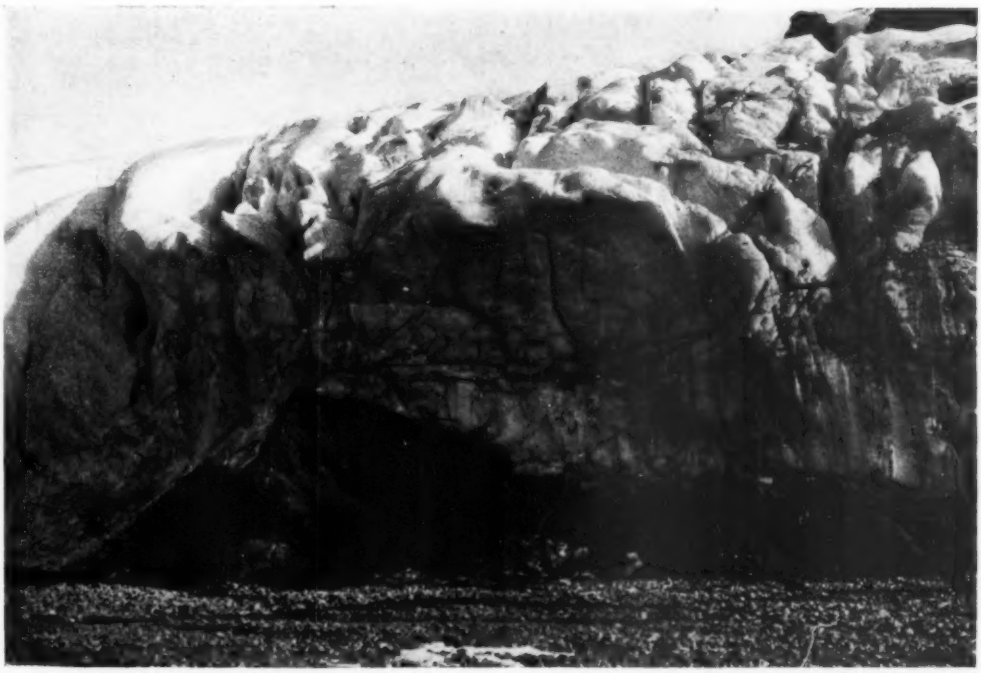
THE GREENLAND ICE-CAP IN PARKER SNOW BAY

Horizontally disposed layers of snow and ice may become distorted as shown by the overriding of one ice mass on another

Photograph by D. B. Macmillan

THE ESKIMO VILLAGE OF PETERAVIK AND CLEMENT MARKHAM GLACIER

The Clement Markham glacier is one of the outlets of the Greenland ice-cap, which passes alongside the black-striped Cape Chalon to Smith Sound



Photograph by D. B. Macmillan

FRONT OF BROTHER JOHN'S GLACIER, FOULKE FIORD, GREENLAND

Brother John's glacier, named by Doctor Kane in 1855 after his brother John, dips into Alida Lake at the eastern end of the Foulke Fiord. Note dark terminal moraine at base

TWIN GLACIERS OF THE TAKU INLET, ALASKA

Taku Inlet is a beautiful fiord just south of Juneau, the capital of Alaska. It is visited by thousands of tourists every year. Taku glacier, which is 30 miles long, heads to the north on a 5500-foot snow divide. It receives some ten tributaries from ½ to 1½ miles wide, the main glacier being 2 to 3 miles wide. It gives off two distributaries, one of which feeds the west half of the Twin Glaciers of Taku Inlet. Other glaciers which enter the fiord are the Morris, and the Wright, and numerous small glaciers up the Taku River

width, which encircles the continent, offers a serious obstruction to those who would approach it. It is a large continent with margins coinciding roughly with the Antarctic circle, and having an estimated area varying from 3,000,000 to 5,000,000 square miles. So little land is exposed that solar radiation has no effect upon the snow and ice masses during the long dark winters, and but little during the summer months. The average temperature at widely separated points on the margin of the continent is 29° F. during the summer and –35° F. during the winter, with maximums of –45° F. There is no melting and probably no other form of precipitation than that of snow, which has been estimated to be from seven to ten inches annually. It is difficult, however, to take such observations, owing to the drifting of loose snow by the wind. Mawson has aptly styled it "'The Home of the Blizzard."

The depth of the inland ice is unknown, but it may well be thousands of feet thick. Amundsen and Scott, after crossing the level ice of the Great Ice Barrier, climbed up from 1000 to 8000 feet over huge glaciers, between mountain peaks approximating 11,300 feet high, to an ice-covered plateau the greatest elevation of which was 9860 feet. The elevation at the South Pole as noted by Scott was 9070 feet.

The numerous glacier outlets from this ice plateau to the Great Ice Barrier below vary as to size. Through one of them passes the Beardmore Glacier, which is more than 125 miles long and from 10 to 20 miles wide, with a total area of at least 5000 square miles. This is the largest valley glacier that has been recorded anywhere.

The Great Ice Barrier is different from these glaciers in many ways. Various

explorers have shown that it is afloat for at least 400 miles from east to west along its outer margin on the Ross Sea. It exposes a seaward cliff from 50 to 280 feet above the water, and forms a vast plain of ice extending southward about 400 miles, along the foot of the high mountains bordering South Victoria Land. The numerous glaciers, which move down from this high land to the Barrier, cause the ice of the Barrier to move forward toward the Ross Sea at the rate of 1500 feet per year. The structure of the marginal face of the Great Ice Barrier shows that it is not a true glacier, but that it is composed primarily of thick layers of snow horizontally stratified. An indentation of the Ross Sea near the easterly end of the Great Ice Barrier, known as the Bay of Wales, is the place from which Commander Richard E. Byrd and Sir George Wilkins have proposed to conduct their forthcoming respective aëroplane exploration flights in the Ross quadrant of the Antarctic continent.

It may be seen from the foregoing discussion that glaciers are at home in either high latitudes or high elevations. Where the snowfall is in excess of melting and evaporation, a blanket of snow remains the year round. The lower limit of this snow constitutes the snow-line, while the snow-covered area above is known as the snow field. Where the snow accumulates to considerable thicknesses, or where it stands for months, it is transformed into a granular stage called névé, and at lower levels into ice. The névé stage is intermediate in position between freshly fallen snow and the ice of a glacier. The exact process by which the transformation takes place is not yet demonstrated, but it is apparently a molecular rearrangement in which snowflakes join together to form

TERMINUS OF THE TAKU GLACIER, TAKU INLET, ALASKA

Taku glacier discharges icebergs into Taku Inlet. Its sea front is more than a mile wide and 200 feet high. A maze of seracs and crevasses appear on the surface of the glacier, while at the front, two dark patches near the water's edge show where englacial streams emerge from the depths of the ice mass. Taku glacier is one of the numerous tidal glaciers found in Alaska. The depth of the submerged ice-front is not known, but it is supposed that it is several hundred feet

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THE MONTE ROSA GLACIER, SWITZERLAND

About nine miles southeast of Zermatt, Switzerland, appear the high serrated peaks of Monte Rosa, 15,217 feet above the sea. From this elevation about fifteen glaciers move down the mountain-sides in various directions. From the highest crests the Monte Rosa glacier descends in a northwesterly direction for three miles toward Zermatt. About the margin and within the path of this glacier, various rock masses projecting above the surface of the ice stream constitute the source of the bowlders and other material displayed so conspicuously in the lateral and median moraines shown here

larger crystals, névé, and solid ice. In going the length of a glacier, one also encounters these three stages, to wit: in the higher levels the *snow field*, at a lower level the granular ice or *névé*, and for the remaining levels down to the terminus, or snout, the *ice stream*.

The exact thickness required for the beginning of ice-flowage is unknown, and it doubtless varies with the temperature of the ice and the slope on which it rests. In all probability a depth of several hundred feet of snow is required, perhaps more in Arctic regions where the cold delays the transformation of snow, first into névé, and then into ice. It is believed that the flowage of the ice in the lower portion of a snow field is a direct result of the pressure of the superincumbent load. Ice, like rock, is brittle under ordinary atmospheric pressures and is easily broken, but under the pressure of several hundred feet of snow and névé, strains and stresses no longer cause rupture, but give rise to flowage. Accordingly, a large mass of ice consists of an upper zone of fracture and a lower zone of flowage, as in the rocks of the earth's crust. The size of a glacier varies with the extent of the contributing snow field. It may be small and short, or it may be many miles long, and many miles broad, according to the snow supply.

The small glaciers may terminate only slightly below the snow-line, but the larger ones may descend thousands of feet below it. The majority of valley glaciers terminate on land, a few in lakes, and some of the large ones, in polar or subpolar regions, reach the sea and discharge icebergs. Glaciers terminating in the sea

like Muir, Taku, Hubbard, and Columbia in Alaska, and the Clement Markham and Umanak in Greenland, are called *tidal* glaciers. They present fronts from 900 to 1000 feet both above and below sea level. The Humbolt Glacier in Greenland enters the sea along a front 60 miles wide, but many other tidal glaciers are only 5 miles wide.

Four main types of glaciers have been recognized, namely:

(1) Valley glaciers, which are confined to valleys. In this connection it should be noted that a small valley glacier occurring high in the mountains is sometimes referred to as a *cliff* glacier, owing to its high back wall of rock, or as a *cirque*, since it occupies a basin like an amphitheater.

(2) Piedmont glaciers, which represent bulbous accumulations or the union of two or more valley glaciers on a plateau at the foot of a mountain, such as the Malaspina glacier in Alaska.

(3) Ice caps, which represent those larger ice accumulations where the movement is outward in all directions from the center. Ice caps are normally thickest at their centers and thinner at the edges. They are typically developed only in polar or subpolar regions.

(4) Continental glaciers, or large ice caps, which exist in Greenland and Antarctica. In those lands it is estimated that the ice caps are more than 5000 feet thick at their centers, the ice moving outward in all directions.

Rows of stakes or stones placed in line across a glacier are found to change their position with respect to objects on the bank, and also with regard to each other.

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THE GRAND MULETS AND MONT BLANC

Mont Blanc (15,782 feet) is the highest of European mountains. Since 1860 it has formed the boundary between France and Italy, and although composed chiefly of granite, it is shrouded with a thick mantle of snow. The crest of the mountain is six miles south of Chamonix, while the Grand Mulets (10,030 feet) are four miles. Numerous glaciers emanate from the snow-capped Mont Blanc. The most famous of these is the glacier des Bossons, for the trail to the Mulets and Mont Blanc traverses it. Yawning crevasses are present here as on other glaciers

Photograph by W. J. Morden, 1926

GLACIERS IN THE TIAN SHAN MOUNTAINS OF CENTRAL ASIA

View taken near Kain-ya-lak, Chinese Turkestan, just north of the Musart Pass (12,125 feet). During the glacial period many large glaciers 30–50 miles in length were developed in the Tian Shan mountains, but at present the glaciers are of comparatively small size, and resemble closely those of the Alps mountains. The living glaciers rarely descend below a height of 12,000 feet

The stakes in the center of the ice-stream gradually move away from those at the side, proving that the center moves faster than the sides. It has also been shown that the surface portions move more rapidly than the deeper layers where the friction is greatest.

The surfaces of glaciers oftentimes present yawning fissures known as crevasses. They are developed wherever there is appreciable tension or straining of the ice. They may be produced by an abrupt change in the gradient of the glacier bed, or by the more rapid movement of one portion of a glacier with respect to an adjacent portion, or by thrusting or overriding of one ice mass on another. Crevasses may appear anywhere throughout the length of a glacier. Above the snow-line they are particularly dangerous, since the snow often partly or completely conceals them, and the unway mountaineer who has not tested his snow bridges is apt to disappear suddenly into a yawning chasm 200 or 300 feet deep.

In the lower extremity of ag lacier where evidences of surface melting are more pronounced, mazes of ice ridges, pinnacles, seracs, and crevasses may appear, especially where differential motion or ice falls are manifest. As the ice melts, tiny streamlets of water may find escape through a hole in the ice, known as a *moulin*. The water that finds its way into such openings may cascade to the bottom of the glacier or it may escape through a channel in the ice to the front of the glacier to form englacial or subglacial streams. Large ice caves in glaciers are frequently formed in this manner and may be entered at certain seasons, particularly during the winter, when there is little melting.

In the upper reaches of a glacier the surface is apt to be free of rock débris

but in the middle and lower courses it may be otherwise. The débris is sometimes disposed in the form of belts or *moraines*, and it is not uncommon in regions where tributary glaciers flow into a main ice stream to have *lateral* and *median* moraines or, if the glacial field is complex, to have a series of them occupying various intermediate positions on the ice. The rock material constituting these moraines is derived from the valley walls, where it may be loosened by weathering and cascaded down in snow avalanches or scoured and plucked from the sides and bottom of the glacier bed by the ice itself. In moving forward, glaciers develop frontal or *terminal* moraines as well as *ground* moraines. Ice is a powerful agent of erosion, but when it takes the form of glaciers it is even more powerful; it widens valleys, it deepens lakes, and scrapes away the soil from vast areas to form its various morainal deposits. On retreating, it leaves in certain places scratched and polished surfaces of bare rock; in others, great sheets of unsorted material. This, however, is another story.

In concluding this article it may be said that living glaciers are not only beautiful to behold, but they are powerful. Their solemn splendor is so fascinating that thousands of people visit the more accessible ones every year. Their extent and work are small as compared with that of their giant forebears of the Glacial Period, yet they are of special interest to us, for they give us a clue as to what the climatic conditions and vicissitudes were in those eventful times when palæolithic man had to clothe his body with furs and make his home with wild beasts in the not too comfortable limestone caverns of southern France and northern Spain.

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THE CREVASSED SURFACE OF THE RHONE GLACIER, SWITZERLAND

The Rhone glacier which is about six miles long, affords many admirable views of its fantastic ice masses. The glacier descends in a series of terraces from about 11,400 feet to 5,750 feet, where it gives rise to the Rhone River. In the foreground of the picture many yawning crevasses are in evidence

A section of the painted and sculptured frieze from the Temple of the Tigers at Chichen Itza, Yucatan, showing Toltec warriors. From a cast in the Museum of the University of Pennsylvania

THE EGYPT OF AMERICA

A Short Outline of the Maya, Who Developed the Outstanding Aboriginal American Civilization, and Left Sculptured Monuments that Record Their History Since Before the Dawn of the Christian Era

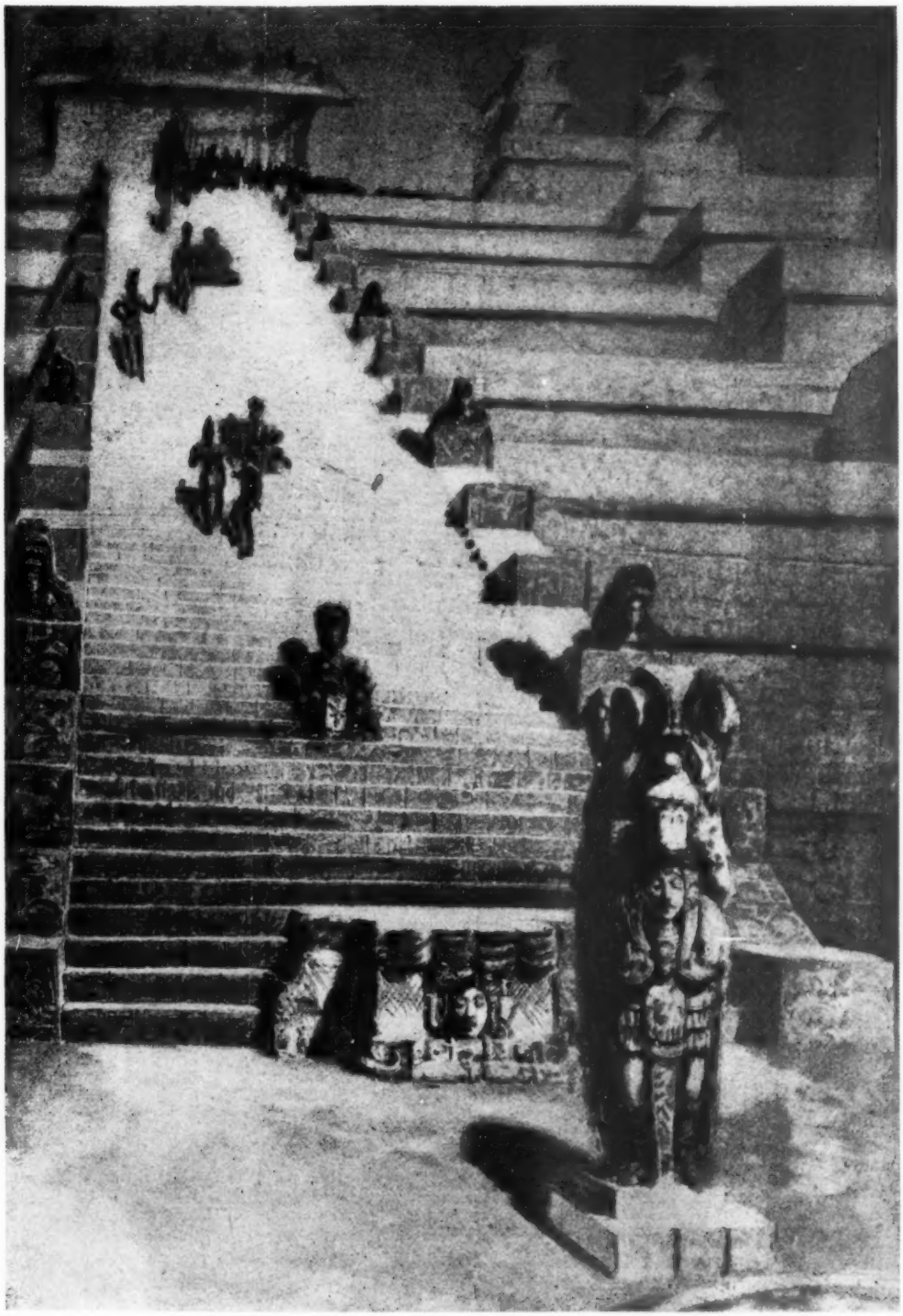
By J. ALDEN MASON

Curator of American Section, University Museum, University of Pennsylvania

THE land of the Maya nation in Guatemala and the surrounding countries of Yucatan, southern Mexico, Salvador, and northern Honduras, has frequently been termed the "Egypt of America." Trite as the term is, it becomes daily more and more appropriate. First employed because of the superficial resemblance of Mayan archæology to that of Egypt, the term receives especial sanction now that the Maya culture is recognized as probably the oldest of the higher civilizations of America, that it was the fountain-head from which many elements of culture spread to the surrounding nations, and that its dated monuments may be employed as the time scale by which other American cultural phenomena can be dated.

Taking into account their background and environment, we may say that the Maya made as great an achievement as any of the great nations of antiquity. Their tropical climate is, and probably always was, enervating and debilitating, and one which made agriculture a ceaseless struggle against the encroaching jungle. Yet here they developed one of the outstanding civilizations of the world, without any contact, so far as has been proved, with the Old World.

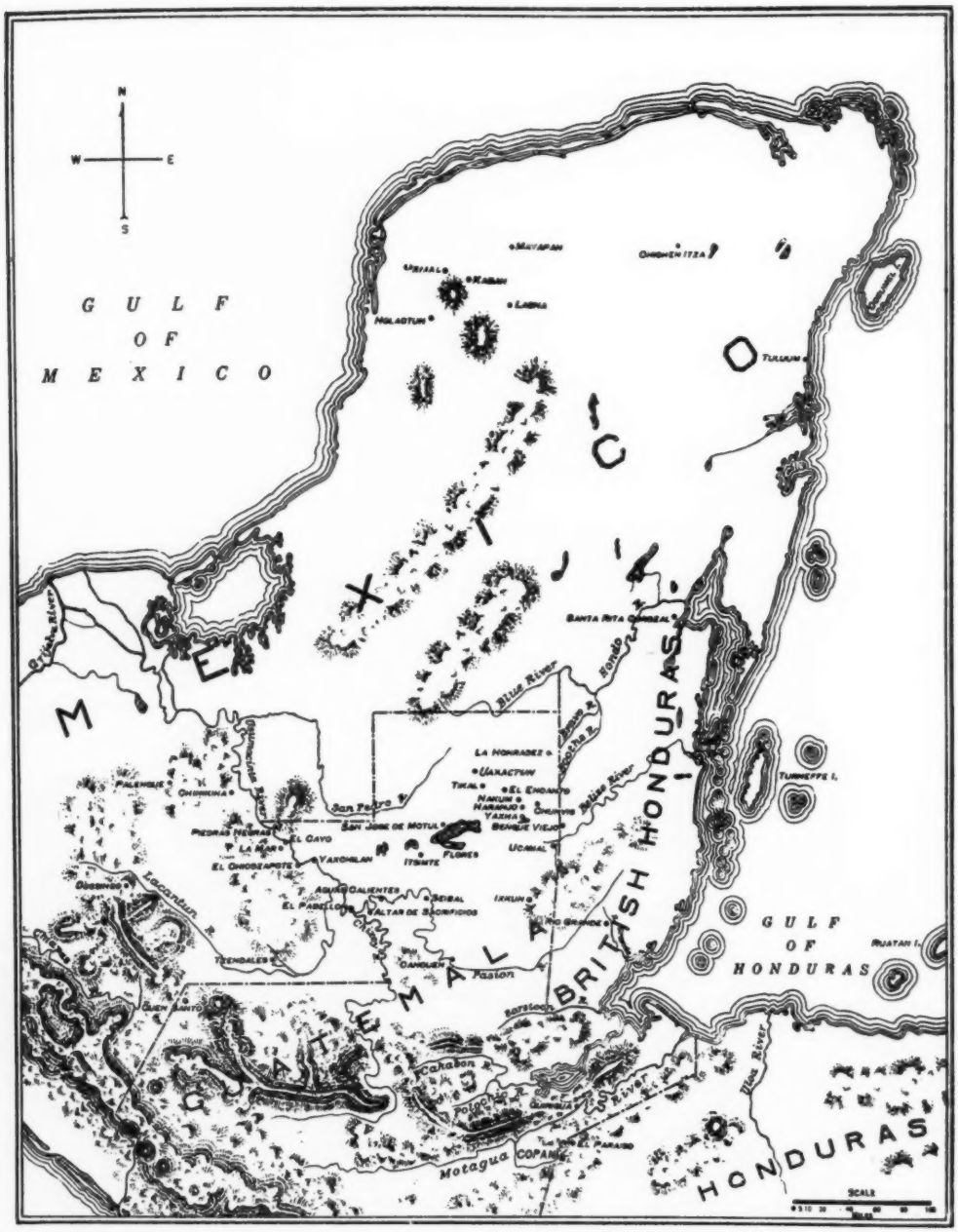
The Maya were the only people in America who had invented a system of writing and who were able to make exact records. This system of hieroglyphic writing is universally acknowledged as the foremost intellectual achievement of ancient America. Although up to the present time less than half of the known glyphs have been deciphered, they give us the skeleton of Maya chronology, since almost all of those so far interpreted are calendrical, astronomical, and mathematical, and refer to definite dates. A few symbols for the cardinal directions and for the colors pertaining to them, some figures of gods, and a few naturalistic objects conclude the sum of the deciphered glyphs. The undeciphered half of the total number of glyphs may record the



THE HIEROGLYPHIC STAIRWAY AT COPAN

(Reconstructed by Dr. G. B. Gordon and Henry Sandham)

An imaginative reconstruction of the famous hieroglyphic stairway on the western side of Mound 26 of the Acropolis at Copan. In this stairway was contained one of the longest Mayan inscriptions known, consisting of about 2500 separate glyphs, only a third of which have been preserved in their original order. Of the original stairway there now remain two sections of fifteen consecutive steps each, and two other sections of undetermined length



THE HOME OF THE MAYA

Map of the region occupied by the Maya civilization, showing location of the principal cities having inscriptions. From *The Inscriptions at Copan*, by S. G. Morley

historical events which took place upon these dates. These hieroglyphs are, in the main, conventionalized pictures and symbols, pictographic and ideographic, but with traces of phoneticism; they are not alphabetic.

The origin of this hieroglyphic system is lost in the mists of antiquity; no tradi-

tion records the name of the originator nor the details concerning the invention. Although the oldest known date records only 96 B.C., the well-developed character of the symbols indicates that they must have undergone a long period of development, and their cursive and curvilinear nature indicates that they were drawn upon a smooth surface long before the art of sculpture developed sufficiently to permit of their being carved upon enduring stone.

In addition to these permanent hieroglyphic inscriptions carved upon stone, the later Maya possessed many books written with these same characters. Unlike the relatively imperishable monuments, these works, in which were recorded all the knowledge of the Maya and which existed in quantities at that time, perished as a sacrifice to the bigotry of the Spanish priests. Bishop Landa wrote, "I collected four thousand of their iniquitous books and images and burnt them on the public square of Tikal, much to the lamentations of the natives." The native could hardly bemoan this holocaust more bitterly than does the student of today, for only three of these priceless books, all now in libraries in Europe, escaped the searching eye and the brand of the friars. These three surviving codices apparently deal with astronomical and mathematical tables and probably were primarily concerned with magical formulæ. The fact that this lore and wisdom were confined to the priestly class was no doubt the cause of the practically complete eradication of all Maya science and wisdom at the time of the Conquest, for the native priests were, of course, but arch-devils in the eyes of the Spanish priesthood, and probably few of them survived by many days the conquest of their villages.

Before reviewing the history of the Maya, let us briefly consider their calendrical system and the astronomical observations and mathematical calculations upon which it was based, for no feat of any people of equal background has

EL CASTILLO AT CHICHEN ITZA, YUCATAN—A VIEW LOOKING SOUTHEAST
Important buildings in Yucatan are usually built on raised foundations ranging from low mounds to high structures pyramidal in form. Ordinarily these pyramids are stepped, with sloping risers

THE GREAT TURTLE AT QUIRIGUA

Animal altars of this type are known only from Copan and Quirigua. If the faces on the tops of altars from Quirigua were arranged in definite sequence, they would demonstrate a development from the simple to the complex in the art of that city. Although known as the Great Turtle, this sculpture has also been designated as a form of what is known as the Two-headed Dragon in Maya art

ever surpassed it. It ranks, with the hieroglyphic system which records it, as the greatest intellectual achievement of aboriginal America.

All calendrical systems must be based upon an exact determination of the length of the year, a difficult feat for nations without precise astronomical instruments. The year, as we know, cannot be divided into an exact number of days or of months, consisting as it does of 365.2422 days and 12.37 lunations of 29.53 days each. These fractions have ever been the stumbling block of calendographers. The Julian year which was in use in southern Europe until 1532, in northern Europe until 1700, and in Russia until a few years ago, was twelve minutes too long, so that at the time of the Russian adoption of the Gregorian calendar, it was wrong by nearly two weeks. The Maya, two thousand years before that, without accurate astronomical instruments, had calculated the length of the year to within one day in 2148 years. Our present calendar is little more accurate, being correct to within one day in 3323 years. The lunar period had been calculated with almost equal accuracy with an error of only one day in 300 years.

In addition to this, the Maya determined with great accuracy the periods of the revolutions of Venus, probably of Mars, and possibly even of Jupiter, Saturn, and Mercury. The Venus calendar was frequently employed, and they were aware, for instance, that 8 solar years almost exactly equal 5 Venus years, and 65 Venus years 104 solar years, or two of their calendar rounds. The solar, lunar, and Venus calendars were combined in permutations so that incredibly long periods of time were calculated. Calculations up to 34,156 years have been found. Eclipse periods were predicted, and very abstruse

A SOMEWHAT IDEALISTIC DRAWING OF A STUCCO BAS RELIEF AT PALENQUE, KNOWN AS THE "BEAU RELIEF"

AN INTERIOR VIEW OF THE BALL COURT, CHICHEN ITZA, YUCATAN
Showing the side wall with a stone ring in place, the goal for the ball. A small, well preserved temple rests on top of the wall

mathematical calculations made. These calculations were based mainly on accurate and long-continued observations on the solstices, equinoxes, and on two points in the agricultural year, April 9 and September 2.

The recording of the mathematical tables depended upon the realization and required the invention of a symbol for the concept of zero. This is another of the Maya's claims to fame. The symbol zero is so matter-of-fact to us that we fail to realize the unusual character of the sign, a symbol for nothing. Yet without such a symbol, rapid mathematical calculations are impossible. It is the zero symbol which makes place-value numeration possible. Nevertheless, it was not until between the Sixth and Seventh Centuries that our symbol for zero was invented in India, from whence it spread to Europe several centuries later. The Maya, the only other people in the world to invent such a concept, anticipated the Hindu inventor by a thousand years.

With these few notes on Mayan intellectual achievements, let us turn to the much more interesting topic of Maya history.

First of all, let me say that the American archæologist recognizes no relationship between the Maya and any people of the Old World. The extreme difference in physical type, language, and the fundamentals of culture is enough far to outweigh any superficial resemblances. The Maya were and are, by blood and language, pure American Indians and their culture apparently entirely American.

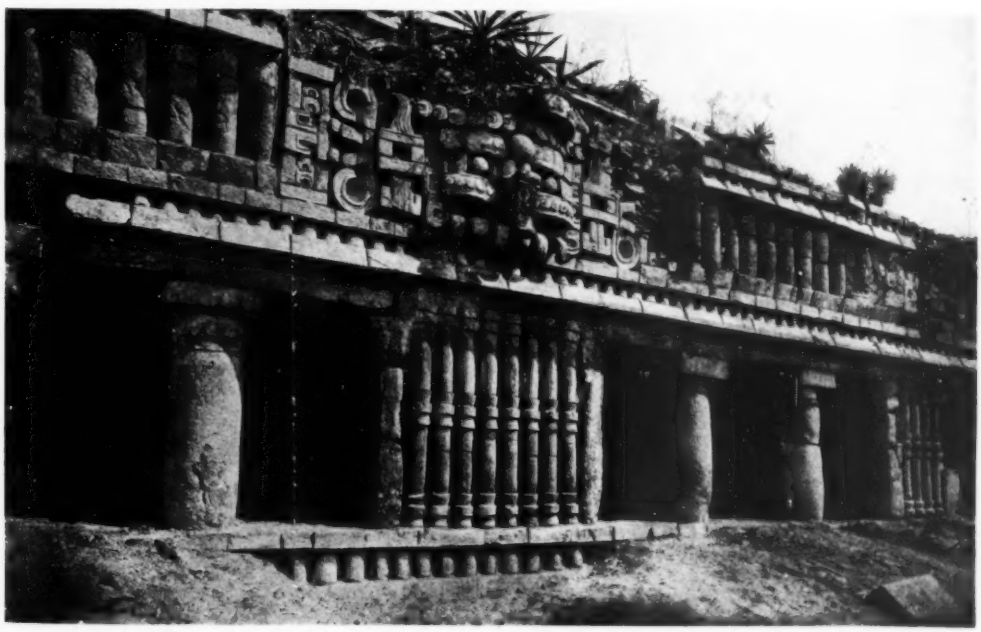
The origin of the Maya we shall allude to but briefly, since it is of small import whether they migrated from the north, south, or west, or developed in their present habitat. Their march toward civilization began possibly several millenniums B.C., when they, or more probably, the neighboring peoples of the Mexican highlands, first domesticated the wild Mexican grass *teocentli* and from it produced maize or Indian corn. With the beginnings of agriculture, life became

sedentary and comfortable, leisure time for the development of civilization increased, and the population grew. Later they added beans, squash, chili peppers, cotton, tobacco, cacao or cocoa, pineapples, and domesticated bees. The invention of the art of making pottery followed close on the heels of agriculture.

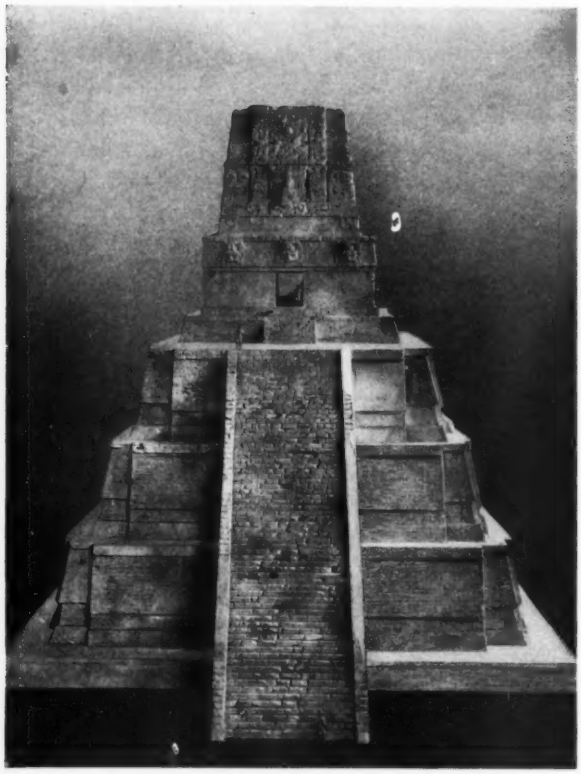
Up to the time of the Christian era, our knowledge of the Maya is mainly surmise, but the wonderful civilization that sprang into full bloom in the next few centuries presupposes many centuries of development. During this period the hieroglyphs were developed, though probably written on perishable mediums, and the foundations of all the arts were laid. The astronomical observations on which the calendar system was erected were also made during this time.

Maya history may be said to begin in 176 A.D., the date assigned to the first vague legendary statement in the historical chronicles. However, for the period of the Old Empire, which lasted until 600 A.D., the chronicles afford us no more than a few vague, general statements; the history of this period is derived almost entirely from the study of the actual remains and the dates as carved upon the monuments. The Old Empire of the Maya, which lasted more than four hundred years, is divided by students into three periods, an Early or Archaic Period to the year 357, a Middle Period to 455, and a Great Period to 600. During this time, dozens of great cities and hundreds of smaller villages were built by the vigorous people.

The oldest of the great cities is Tikal in Guatemala, where was erected the tallest building in the Maya region, attaining, with its pyramid, a height of 175 feet. The great city of Copan in northern Honduras was probably the most important of the cities of the Old Empire. The great hieroglyphic stairway, before its almost complete destruction by an earthquake, was probably the most extraordinary and wonderful sculptural product of aboriginal



THE UPPER STORY OF THE PALACE AT SAYIL, YUCATAN
This is an excellent example of the architecture and decoration of the late Maya Empire



RECONSTRUCTION OF TEMPLE II
AT TIKAL, GUATEMALA

The model shows the edifice with its high roof court, the steep pyramid foundation, and the exterior stairs. The total height is 145 feet. From a model in the American Museum of Natural History made under the direction of Herbert J. Spinden

America. It consisted of some 90 steps, 25 feet in width and 125 feet in length, the risers of which were completely covered with carved hieroglyphs, composing an inscription of 2500 glyphs. It was built about 500 A.D. The architecture of Copan is typical of that of the cities of the Old Empire, the main buildings being grouped in a civic center upon great mounds of earth which elevated them like an acropolis. Large courts and plazas play a great part in the general plan. Upon the whole, however, the edifices of the Old Empire cities are rather plain and massive and without great interest; the artistic urge of the people found its expression in the sculpture of stelæ, altars, and similar independent figures rather than in the embellishment of their buildings.

The most typical city of the Middle Period of the Old Empire is Palenque, a large and well-known ruin in southern Mexico. Here, owing to an apparent lack of suitable stone for carving, most of the decoration is in stucco relief, which the Maya made by burning the plentiful limestone. In this modeling the Maya artist achieved as admirable results as in stone carving, and the stucco reliefs at Palenque are among the most admired examples of Maya art. In architecture, the most important feature is the tower which originally consisted of four stories, communicating by interior stairs. Buildings of more than one story and interior stairs are both of great rarity in the Maya area and speak highly for the ability of the Maya builders in those early days of architecture.

The Great Period or the Golden Age of the Maya reached its height at about the year 520 A.D., The acme of Maya culture was attained at this time, when they must have enjoyed a civilization above that of our Teutonic ancestors in Europe. About seventeen cities known to archæologists were flourishing in the foothills of northern Guatemala and the surrounding region. The arts and sciences were pursued and the common people must have had a comfortable existence.

The great city of this period was Quirigua in Guatemala. It is here that the most beautiful and largest examples of Maya sculpture are found, the architecture of the city being of slight importance. The stelæ, which, like those at Copan, bear dates indicating that one was erected every five years, are exceptional both for

their size and beauty.

About the year 600 A.D., for some reason which has not yet been determined, the great cities of Guatemala seem to have been abandoned. Numerous explanations have been advanced for this, such as devastating plagues of yellow fever, earthquakes, the impoverishment of the soil due to too intensive agriculture, or a change in climatic conditions with increase in rainfall. At any rate, no date later than 600 is found in any of the cities of the Old Empire. For the next three and a half centuries the Maya were in a period of transition, during which time, apparently, the center of the civilization moved from Guatemala northward toward the tip of the peninsula of Yucatan. Here sprang up the Maya civilization anew in a glorious renaissance which lasted from 980 to 1450. New, and even more beautiful and admirable cities sprang up; architecture, sculpture, and all the fine arts experienced a rebirth, but architecture rather than sculpture is the crowning glory of the New Empire.

Dozens of cities sprang up, of which three stand preëminent, Mayapan, Uxmal, and Chichen-Itza. Of these, the first two were founded in the Tenth Century, but Chichen-Itza had a far older history, having been first settled as far back as about 500 and subsequently abandoned. It has thus the longest recorded history of any city in America, 800 years. About the year 1000, these three cities, each the center of an important tribe and ruled by aristocratic nobles, formed a confederation by which the country was to be jointly ruled, and for nearly two centuries the land enjoyed peace and prosperity, the fine arts flourished, pyramids, temples, and other grand structures sprang up everywhere, and the land supported a great population. This period, from 1000 to 1200 A.D., was the New Golden Age of the Maya.

Today, only mounds mark the site of the

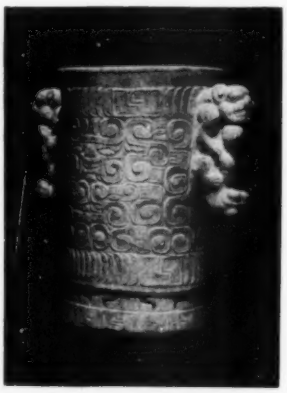
RESTORATION OF THE "TEMPLE OF THE TIGERS" AT CHICHEN-ITZA
(As proposed by Mandslay)

Photograph Through Courtesy of Prof. Marshall H. Saville

A PORTION OF THE GREAT HIEROGLYPHIC STAIRWAY AT COPAN, HONDURAS
Some of the the 2500 glyphs of the lengthy inscription are here shown in detail

mighty city of Mayapan, but the ruins of great Chichen-Itza and Uxmal still rear their stone spines above the Yucatecan jungle, attracting thither scientists and tourists from the world over. They are the most interesting ruins in America.

For, about the year 1190, jealousy and overreaching ambition put an end to the second Golden Age of the Maya, which had flourished for nearly two centuries. The nobles of the three allied cities fell out and civil war ensued. At first the quarrel was apparently between Mayapan and Chichen-Itza, and the resulting conflict changed the complexion of Mayan culture decidedly. The ruler of Mayapan seems to have called to his aid mercenaries or allies from the Valley of Mexico far to the northwest. These allies were the Toltec, the predecessors and cultural tutors of the Aztec. They enjoyed a high grade of culture, practically equal to that of the Maya themselves, with whom there seems to have been considerable interchange of cultural elements. The Toltec at this time had probably just passed the height of their glory, and their empire was beginning to disintegrate, as did that of the Maya after them. It was, however, nearly two centuries before the Aztec began their phenomenal rise to power. It is probable that the growing influence of the Toltec in Yucatan, exciting the hostility of the native Maya, was the primary cause of the civil war. Mayapan seems to have



ONE OF THE GEMS OF MAYA ART
This exquisite carved marble vase from the Ulna River, Honduras, is now in the Museum of the University of Pennsylvania

been the center of Toltec influence in Yucatan. Be that as it may, there is little doubt that the lord of Chichen-Itza plotted against his colleague of Mayapan, who, by Toltec aid, defeated him and took possession of Chichen-Itza.

Then began the Toltec regime in Yucatan, which lasted for about two and a half centuries, from 1200 until about 1450. Throughout the greater part of the country the alien presence left little mark, but in the three great cities the Toltec influence was strong. Uxmal held aloof and yielded to the new fashion only in the erection of a ball-court, but Mayapan must have been thoroughly Toltec in art and architecture. Chichen-Itza was enlarged and beautified by a number of imposing edifices in Toltec or Toltec-influenced style in a new section of the city.

AN EXCELLENT EXAMPLE OF MAYA POTTERY

A cup from the Department of Huepuetenango, Guatemala, which is now in the collections of the Museum of the University of Pennsylvania

Toltec buildings are differentiated from the Maya by a rather lighter and more flowing style, by buildings supported by columns, and especially by columns in the shape of conventionalized feathered serpents, the emblem of Quetzalcoatl or Kukulkan. The ball-court, examples of which are found at Chichen-Itza and Uxmal, is a Toltec element. Most of the more ornate and beautiful buildings at Chichen-Itza were built during this period.

Naturally the rule of the alien Toltec over the native Maya became more and more arrogant and unbearable, until at the end of two and a half centuries of oppression, the natives were goaded to desperate

THE SERPENT COLUMNS OF THE TEMPLE OF THE TIGERS

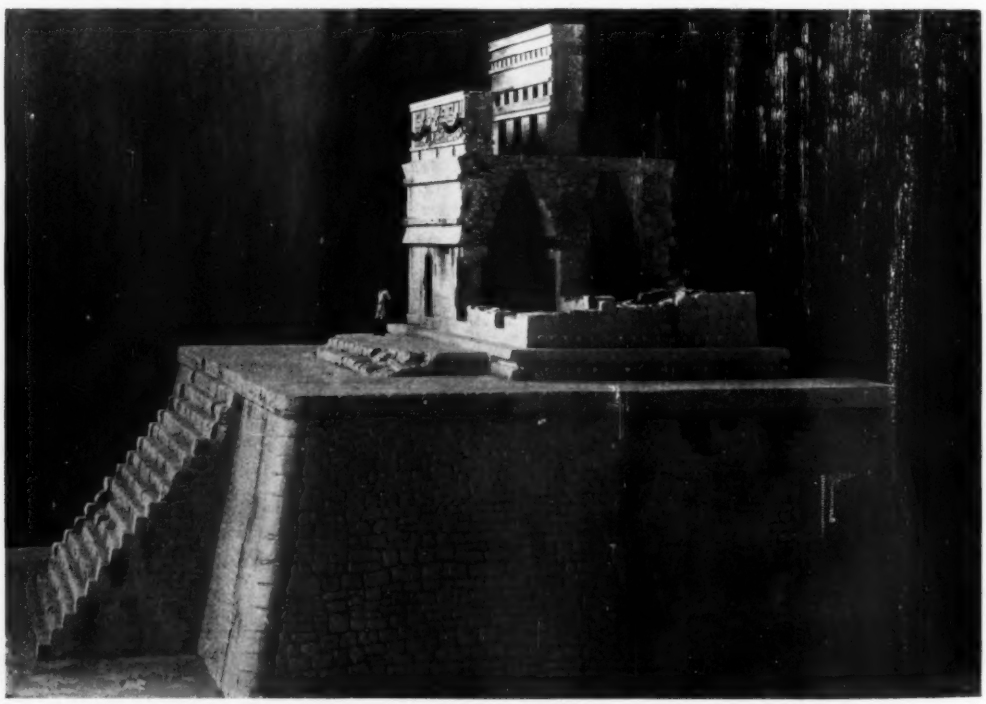
These columns, overlooking the Ball Court at Chichen-Itza, Yucatan, are typical of Toltec art and emblematic of Quetzalcoatl or Kukulkan

rebellion. Under the leadership of the lords of Uxmal, who had heretofore kept neutral in the conflict, the Maya forces united, attacked Mayapan, and slew all the members of the reigning house about the year 1450. Mayapan was so utterly destroyed that today but a few mounds and scattered stones are to be seen.

The fall of Mayapan marked the end of Maya civilization. Apparently the entire country fell into civil war and discord. Chichen-Itza, Uxmal, and most of the large cities were abandoned and no others built in their places. Famine and pestilence, the latter doubtless introduced by the earliest Spanish explorers along the coast, depleted their numbers, and close upon its heels followed the conquerors themselves with their muskets, ferocious dogs, and inquisitorial flames.

The independent spirit of the Maya was not entirely broken, however, and after three centuries of Spanish and Mexican rule they again revolted, and successfully.

Today the Maya Indians still inhabit the peninsula of Yucatan and much of Guatemala, their numbers estimated at 300,000. They are a fine race of American Indians, intelligent, sturdy, independent, industrious, and cleanly to a superlative degree. Many of them work in the great fields of agave or henequén from which comes our sisal hemp for binder-twine. Most of them speak nothing but the Maya tongue, and every Yucatan plantation owner speaks Maya as he does Spanish. But with the extinction of the leisured class, the priests and the nobles, all the accumulated wisdom and craftsmanship of millenniums were soon forgotten, and today only the great abandoned structures in the dense jungles bear witness to the heights attained by the Maya, one of the great nations of antiquity.



RESTORATION OF THE CHICHANCHOB OR RED HOUSE AT CHICHEN-ITZA

A classic example of late Maya architecture and the best preserved building in the Maya area. The model is sectioned to show interior construction, the flying façade, and the roof court. From a model made in the American Museum of Natural History under the direction of Herbert J. Spinden

DESERTED CITIES OF THE CLIFFS

The Great Southwest and the People Who Have Dwelt There.—An Account of the Cliff Dwellers and the Dwellers on the Mesas.

By PLINY E. GODDARD
Curator of Ethnology, American Museum

THE region called the Southwest in anthropological literature has been exceptionally productive of facts and information during the last twenty years. In this region of the Southwest is included all of New Mexico and Arizona and the southern parts of Colorado and Utah. Here grew up in the remote past a culture quite different from that found in other parts of America. The most striking characteristics relate to architecture and pottery. In Mexico, Central America, and the west coast of South America very large stone buildings were erected in ancient times, but it seems they were used as temples and palaces. The dwellings were small and usually temporary and perishable. In the Southwest are many buildings, inhabited and in ruins, covering great spaces of ground and reaching a height of several stories. These were devoted chiefly to the housing of the people and the storage of their food supplies.

To a great extent in America pottery in some form was made for household uses. The pottery of the Southwest is quite distinct in its decorative features, and recent finds make it seem probable that it had a fairly independent development. Associated with the communal life of these urban people is an interesting social and governmental organization with elaborate and numerous rites and ceremonies.

A fair description of these Indians and their ways of life may be found in the accounts of the Coronado expedition dating from 1540. There are several other reports in Spanish, written during the Sixteenth and Seventeenth Centuries. The American occupation dates from 1846. A number of interesting descriptions of the country and people were written by Americans who visited the country in official capacities, but the first real studies were made somewhat later.

As elsewhere the studies in the Southwest are divided into two groups, those related to the remains of people no longer existing, and those concerned with the living people. The first is known as archæology and the second as ethnology. The methods employed are quite different, and each attracts students of different temperaments and interests.

The first archæological accounts are by members of the U. S. Geological Survey. One of the early ones is by W. H. Holmes who, in the summers of 1875 and 1876, accompanied the U. S. Geological and Geographical Survey of the Territories as artist. During the same two years and in 1877 W. H. Jackson was on this survey. Both wrote accounts of the ruins in the San Juan drainage. Professor Holmes later became chief of the Bureau of American Ethnology at Washington, and curator of anthropology in the U. S. National Museum. The first systematic archæological studies in that region were carried on by A. F. Bandelier under the auspices of the Archæological Institute of America. This work was begun in 1880 and continued until 1910. It was largely descriptive in character. In 1893 Nordenskiold, a member of a noble Swedish family noted for their scientific interests, wrote an account of the cliff ruins of Mesa Verde in southern Colorado.

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CLIFF DELLINGS IN THE RITO DE LOS FRIJOLES

The "cavate lodges" honey-combing the north wall of this picturesque cañon, represent for the most part, back rooms of the thirteen villages that formerly stood on the talus slope, but of which few vestiges now remain

The American Museum began in 1895 the excavations of Pueblo Bonito, one of the largest of the ruins in the Southwest. This was financed by B. T. B. Hyde and his brother, who also acquired important collections from southern Colorado and Utah. Mr. George H. Pepper had charge of the work at Pueblo Bonito and of the collections secured by purchase.

The next active period of archæological work began about 1910. The main participants have been Peabody Museum of Harvard University, Phillips Academy of Andover, Massachusetts, the Archeological Institute of America, Smithsonian Institution through both the National Museum and the Bureau of Ethnology, the Museum of the American Indian (Heye Foundation), the National Geographic Society, and the American Museum of Natural History.

The Peabody Museum has devoted its work chiefly to the western portion of the San Juan drainage, where very important discoveries have been made by Samuel Guernsey and A. V. Kidder. Phillips Academy, with Doctor Kidder in charge, has completed a very thorough excavation and examination of the Pecos ruin, which was abandoned by its inhabitants in 1838. The Archeological Institute, under the direction of Edgar L. Hewett, did important excavation and repair work on the Pajarito Plateau and in Frijoles Cañon west of the Rio Grande. The work of the U. S. National Museum and the Bureau of Ethnology represented by Walter Hough and Jesse W. Fewkes, respectively, has been chiefly at Mesa Verde and the Little Colorado and Gila River drainages in Arizona. The Museum of the American Indian, with F. W. Hodge in charge, excavated the Zuñi ruined pueblo of Hawikuh, and has done important work in Nevada, superintended by M. R. Harrington. The National Geographic Society has financed five seasons of work at Pueblo Bonito, which has been conducted under the management of Neil M. Judd. The American Museum began its work in the Galisteo region of New Mexico with N. C. Nelson in charge, and later

undertook the excavation and repair of Aztec ruin on Animas River in northwestern New Mexico. The latter undertaking has been conducted chiefly by Earl H. Morris.

More recently extensive work has been done by Doctor Kidder and Mr. Morris in the two cañons, del Muerto and de Chelly. Not all the institutions and individuals concerned have been mentioned, but from the above enumerations the scope of the work will be apparent.

All this is preliminary to an appraisal of the results obtained in the form of knowledge during the last eighteen years. In 1910 we knew there were extensive ruins abandoned before the Spaniards arrived in 1540, and that the people who had inhabited them were agriculturists, growing cotton, as well as corn, beans, and squash; that they made excellent cloth of the cotton for their wearing apparel; that, while they made baskets, their household vessels were in the main chiefly made of clay. These pots were known to be beautifully decorated, chiefly by the use of designs painted in black on a white background. From southern Utah a culture believed to be different and perhaps earlier, had been named Basket-Maker, since they were known to make excellent baskets but no pottery. Aside from the last inference as to time, nothing was known about the time relations in the Southwest except what had been recorded by various writers since the Spaniards took over the country.

Mr. Nelson in his work in the Galisteo valley had a date, that of the rebellion in 1680, as the most recent in that region. It was also possible to determine with considerable accuracy whether a village site had been occupied after Spanish times, since the bones of domestic animals and objects of European manufacture were certain evidence of later occupation. He next attempted to arrange the various sites in the order of their dates on the basis of the pottery finds. The pottery vessels first had to be arranged in a time sequence. This he attempted to do by finding buildings containing one type superimposed on others which, of necessity, would be older. Failing in finding conditions of this sort in

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THE ANCIENT VILLAGE OF TYUONYI

This great community house was the principal focus of population in the Rito de los Frijoles. It was a terraced structure, built of blocks of tufa, and the débris indicates that it was three stories in height

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THE HOPI VILLAGE OF WALPI
From their homes on the mesa top these villagers may keep a watchful eye on their fertile fields below, and also on the surrounding plain, a circumstance of great value in the days when enemy raids might be expected

sufficient number and variety to settle the problem, he resorted to a rubbish heap, which he sectioned from top to bottom. At the top were evidences of post-Spanish occupation. As he went down, there were gradual pottery changes corresponding to time sequences. The results obtained in this manner checked with his finds in superimposed buildings.

Doctor Kidder at the same time was studying the pottery in the region of the Pajarito plateau. This method of using the stratification of the rubbish heaps as a measure of the true relations of pottery was used brilliantly by Leslie Spier in the region of Zuñi, New Mexico, by Earl H. Morris in his work at Aztec and elsewhere, and by Doctor Kidder and those associated with him. We know now not only the chronology of ceramic development in the Southwest, but we know the local variations in form and decoration. By means of the pottery, the remains of the particular rooms in a ruin can be given a date relative to others. It appears that considerable trading took place, and by means of traded pottery it is possible to say that certain villages in the Southwest were occupied contemporaneously. Since the ruins can be arranged in a time sequence on the basis of the pottery, the history of architecture is also discoverable.

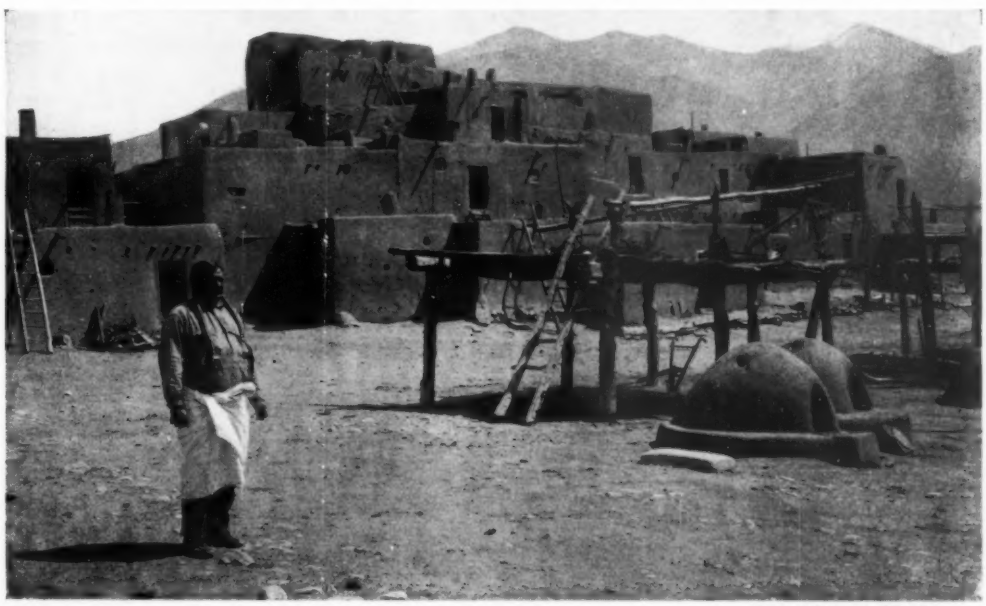
Briefly, we know that there were a people in the Southwest who raised corn of two varieties, who made excellent baskets, whose houses did not survive, but their practice of burying the dead with accompanying objects in dry caves left a definite record of them. These people are the Basket-Makers, so named by Mr. Pepper. Mr. Guernsey, of the Peabody Museum, has made the most noteworthy contributions to our knowledge of these people. Following them were a people of similar culture but who began to experiment with clay for the making of house-

hold vessels. The clay was mixed with corn husks or shredded cedar bark, molded in baskets, and dried in the sun. The houses were made by placing stones on edge in a circle and erecting a dome-shaped hut above them, which was covered with bark and plastered with clay. These people have been called the Post-Basket-Makers. Our most detailed information concerning them comes from Mummy Cave in Cañon del Muerto. The work was done by Doctor Kidder and Mr. Morris, but has not yet been published.

Following these were a people who made proper pottery, decorated crudely with painted designs and well fired. Their houses were similar to those described above, but they soon began the erection of rectangular houses of stones laid up in adobe clay. These houses contained several rooms above ground and an underground chamber called a kiva. These people have been known as the Pre-Pueblo people.

Following was the Pueblo period, when the people gathered together and produced the many-roomed buildings for which the Southwest is famous. Some of these stood in caves and have been splendidly preserved. Among them are Spruce Tree House and Cliff Palace in the cañons of Mesa Verde, Betatakin in Northern Arizona, White House in Cañon de Chelly, and the great ruins in Mummy Cave, Cañon del Muerto. Other buildings of the same period were built in the open. Those of Chaco Cañon, (which include Pueblo Bonito), and the ruin called Aztec, are examples of this period. Not only is the architecture of this period the most ambitious, but the pottery is superior to any produced earlier or later.

For some reason many of the outlying regions were completely abandoned at the end of this period. The most probable cause was the pressure of enemies, better warriors, no doubt, than the sedentary agriculturists. Following this in the east there was experimentation with a glaze paint for pottery decoration, and in the



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A NEW MEXICO SKYSCRAPER

The Tigua village of Taos, beloved of artists, boasts of a greater height than any other pueblo of the Southwest, rising to seven stories. It is a conservative community, and retains many of its ancient religious practices

west the use of white and black on a yellow ground. The eastern settlements were slowly yielding when Coronado arrived, introducing certain phases of European culture. The most readily accepted contributions from Europe were metals and domestic animals. Christianity, as represented by the Catholic Church of the time, was accepted reluctantly and only in part.

The work among the living peoples began with Frank Cushing, who resided in Zuñi, one of the larger villages, from 1879 to 1884. Doctor Fewkes took over the work which had been supported by the Hemingways of Boston, and turned his attention chiefly to the Hopi. The American Museum began its active work in 1909 under a grant made by Archer M. Huntington. Dr. Herbert J. Spinden spent several seasons mainly in the Rio Grande villages, Dr. A. L. Kroeber was in Zuñi for a summer, Robert H. Lowie investigated the Hopi, and Leslie Spier made a thorough study of the Havasupai. Much important work has been done by Dr. Elsie Clews Parsons, personally, and by others working with funds supplied by her. Doctor Parsons and Dr. Ruth F. Benedict have done much at Zuñi, Prof. Franz Boas at Laguna, Mrs. Esther Schiff Goldfrank at Cochiti and Isleta, and Leslie White at Acoma. Dr. Ruth Bunzel has acquired a speaking knowledge of the Zuñi language and is engaged in a minute story of Zuñi family, social, economic, and religious life. Her work has received the support of Columbia University and the Social Research Council.

It is too early to summarize the results of this ethnological work. The social and religious life is very complicated, and the latter evidently subject to constant change. There are important differences between the various villages, and evidences of borrowing back and forth. Just now there is much interest displayed in the separation of elements contributed by or adapted from the Spaniards.

No other region has yielded so much; no other region promises so much for the future.

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A CEREMONIAL CHAMBER

Ninety feet of ladders and 200 feet of rock trail and stairway must be climbed to reach this ancient kiva, burrowed into the floor of a cave high up in the cañon wall at the Rito de los Frijoles

PEOPLE OF THE FOGGY SEAS

The Aleut and Their Islands

By WALDEMAR JOCHELSON

Former Division Curator of the Museum for Anthropology and Ethnography of the Russian Academy of Sciences in Leningrad

The author of this article spent the years 1909 and 1910 among the Aleutian Islands as the head of the Anthropological Division of the Aleut-Kamchatka Expedition that had been sent out by the Imperial Russian Geographical Society of St. Petersburg (now Leningrad). Heretofore only his "Archæological Investigations in the Aleutian Islands" have been published (Carnegie Institution Publication, No. 367, Washington, 1925), and the following article, therefore, contains material never before presented to the public.—THE EDITORS

FOR about one thousand miles the Aleutian Islands stretch from the Alaskan Peninsula in a long bow-shaped chain of seventy treeless islands, excluding the numerous islets. All of the islands are of volcanic origin, and are covered with high mountains, among which are both active and extinct volcanoes. The shore line is irregular, the rocky mountains sloping abruptly to the sea. The bays are shallow, full of reefs, and dangerous for navigation.

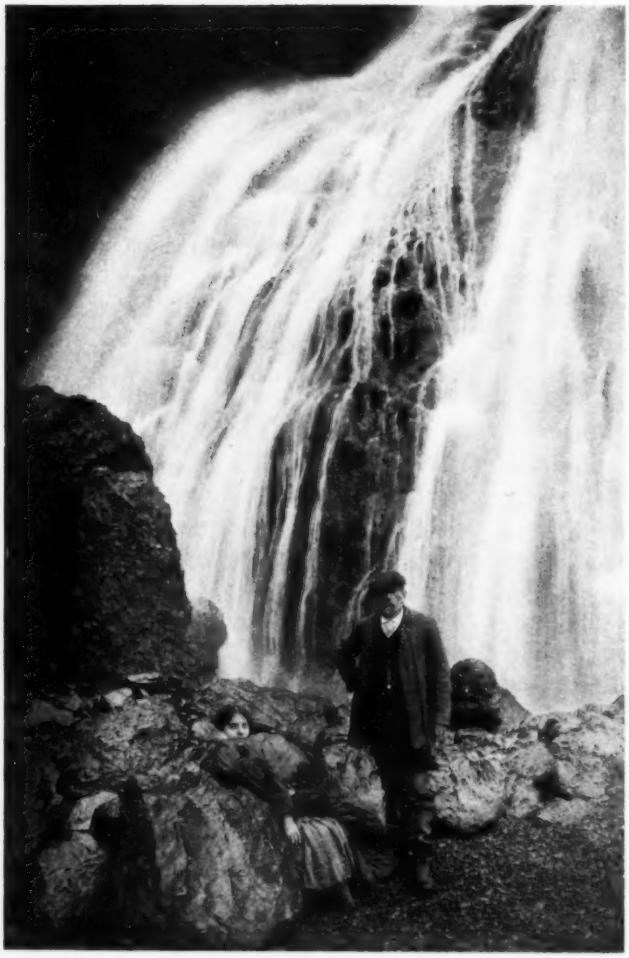
The vegetation is luxurious though limited to grasses, berry-bearing shrubs, creeping bushes, and varieties of low willows. On the mountain slopes we find an alpine vegetation and various species of mosses and lichens. In the narrow valleys between the mountain ridges and on the low isthmuses with insufficient drainage, are fresh-water lakes with hummocky shores, such as characterize the Siberian tundras. The hummocks are covered with sedge grass. The absence of arboreal vegetation is due not to the climate, which is comparatively mild, but to the constant gales, and to the fogs and mists that are encountered in Aleutian waters, and that deprive the plants of much sunlight.

The fogs and gales result from the meeting of two extreme currents—the cold from Bering Sea and the warm, Kuro-Shivo, from the Pacific.

During the visit of the Kamchatka-Aleutian Expedition to these islands, I made regular meteorological observations, using a centigrade thermometer. For the period from March 1, 1909, to March 1, 1910, the annual mean was 3.9 (39° F.), with a maximum of 16.5 (62° F.) (on the island of Atka, August 12, 1909), and a minimum of–13.0 (9° F.) (on the island of Umnak, February 1, 1910). There are only two seasons: a long autumn and a short, mild winter. But the incessant winds and gales cause the slightest cold to be felt and, in summer particularly, the constant fogs hide the sun. Throughout my nineteen months' stay in the islands, the sky was clear only nine days.

Some of the Aleutian Islands were densely populated, and it has been estimated that nearly 30,000 natives inhabited them when the Russian invaders arrived there in 1745. The Aleut throve on sea-otter and other game, an important part of their diet being the palatable meat of the "sea cow," a sea mammal described by Steller, the naturalist-explorer and member of the Bering expedition. All these sea mammals were exterminated by Russian and other white hunters. Deprived of food resources, and with rapacity and exploitation rampant, the Aleut decreased in numbers.

According to official data in 1910, the total number of Aleut was 1232. Of these,



DOCTOR AND MRS. JOCHELSON BESIDE A WATERFALL ON ATKA ISLAND
Mrs. Jochelson was anthropologist of the Aleut-Kamchatka Expedition and assisted her husband in the excavations on the Aleutian Islands (1909–10) and on Kamchatka Peninsula (1910–11)

221 were in the nine settlements of the Alaska Peninsula; 9 lived on the Shumagin Islands (Simonovsky and Wosnesensky); 282 dwelt on the Pribilof Islands (Saint Paul, 195; Saint George, 87); and 479 were on the Aleutian Islands (Sanak, 36; Unimak, 9; Akutan, 51; Biorka, 46; Unalaska, in five villages, 383; Umnak, 100; Atka, 77; Attu, 62). Adding to the Alaskan Aleut, the 501 Russian Aleut of the Commander Islands (Copper Island, 234; Bering Island, 267), according to my data of 1911, we arrive at a total of 1733 Aleut.

At the time the above figures were gathered, the non-Aleut or white population in the Aleut territory numbered 237. It was not evenly distributed, the greatest number of whites living on the island of Unalaska. On the Siberian Commander Islands were 51 white people; on the Pribilof Islands only 9 (chiefs, doctors, priests, school teachers, and government storekeepers).

On the Pribilof Islands sealing is carried on under the U. S. Government, and the islanders are regarded as Government laborers. According to existing regulations, no outsider may land on the Pribilof Islands without a special permit from the U. S. Government. This restriction also applies to the crews of the revenue cutters cruising around the islands during the summer. On the other hand, short leaves of absence are reluctantly granted and no Pribilof Aleut is permitted to return home after a year's absence. The Pribilof Aleut, however, appear to be happy and healthy.

Of great interest are the regulations concerning the killing of fur seals and the remuneration of the killers. All the adult Aleut take part in the killings. Almost every day during the summer, fur seals from one rookery or another are cut off from escape by the sea and are driven inland. About half a mile from the shore the herd is examined. Females, old males, and puppies are selected and returned to the coast, and the males between two and

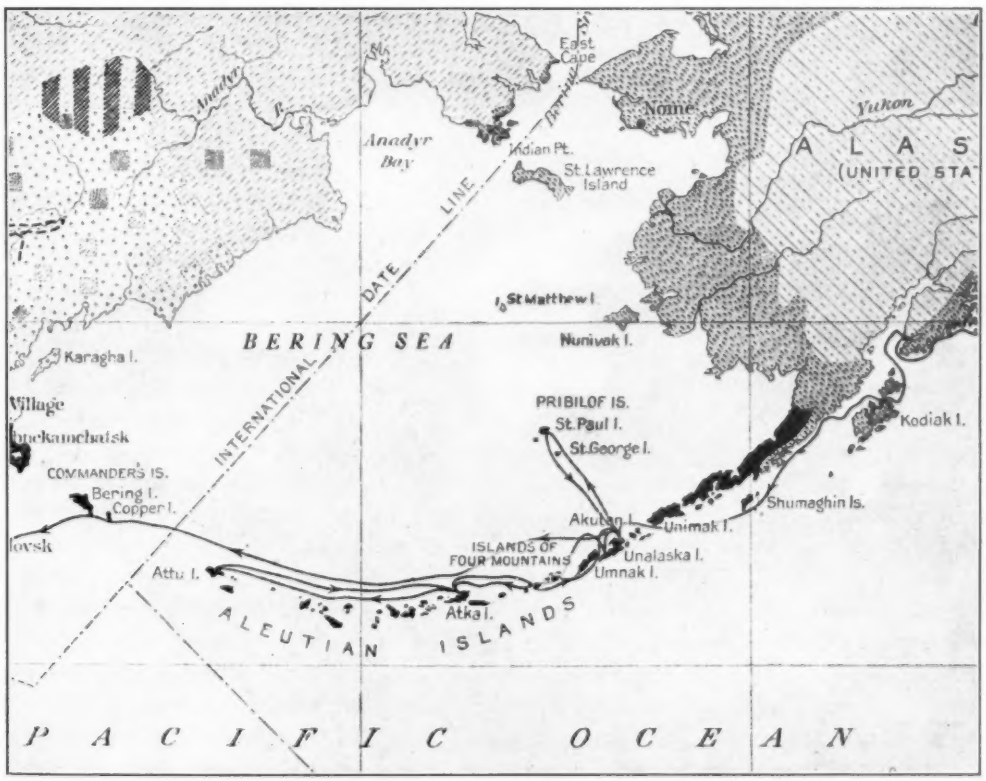
five years old are driven to the killing places. The slaughter presents a most painful spectacle. The animals are clubbed senseless by blows with long sticks, after which their throats are cut, and they are skinned.

The community is credited with two dollars for each seal killed, and each family head has an account with the Government store, where he can obtain ready-made clothing, imported food, tools, instruments, and other needed commodities, as well as luxuries. Toward the end of the year, the hunter receives his balance in money, and in case of an excess, the difference is carried over to the account for the following year. Large families receive more than small ones, regardless of the number of hunters, and widows and orphans of men who have died in the Government's service receive their shares.

Sealing is a profitable business. For instance, 21,302 sealskins were sold in 1927 for $745,410, and 728 blue foxes, which abound on the islands, were sold for $38,729.

The Aleut are comfortably housed. Each family has a nice cottage, and receives stoves, coal, electricity, and in general is well provided for.

All these regulations and arrangements were adopted from the Russians when Alaska was sold by them to the United States, but with this difference: there are no abuses under the American administration. On the whole, however, the Pribilof Islands, with all their abundance and happiness, seem to me to be more like



MAP OF THE ALEUTIAN ISLANDS AND VICINITY

The Aleut territory is indicated in black, and the route taken by Doctor Jochelson throughout the Islands is also outlined in black

ALEUT HUNTERS

When he goes down to the sea, the Aleut hunter wears a waterproof shirt made of intestines of sea mammals and ornamented along the seams with the down of gay-colored birds. Long throwing darts are also part of the outfit. The painted wooden ceremonial hats, decorated with sea-lion's whiskers, are relics of former times, and are now replaced by the small wooden eyeshade shown on page 417

an honorary penitentiary.

The poorest of the Aleut are those who live on Attu Island, where there are no seal rookeries at present and where the sea mammals were exterminated by foreign hunters. These people have no skins for skin boats, they go almost naked, and during the winter suffer from famine.

To learn what has happened to the Aleut since my visit, I have looked over the reports of the Governor of Alaska to the Secretary of the Interior for the last ten years, and was surprised to find no mention of these people. Among the Alaska public schools are named those of Umnak, Kashega, Unalaska, Akutan, and Belkovsky,[1] and in the report of 1923 I find information of a plan to introduce herds of sheep into the western ends of Unalaska and Umnak Islands. These localities are covered with grasses, lakes and rivulets, where sheep may thrive, and in the mountainous districts reindeer could be raised. In 1909 when the chief of the Bering Sea Patrol Fleet, Capt. William V. E. Jacobs, asked my opinion on this subject, I furnished him with samples of several species of the lichens on which Siberian reindeer feed, and which grow also on the mountains of the Aleutian Islands.

[1]In 1910 there was also a school on Atka Island.

RELIGION

The old beliefs of the Aleut were of a complicated character. Evil spirits (*kugan*), causing sickness and death, were fought by shamans, conjurers, and the spirits of departed relatives. The souls of the dead (*angix*) visited relatives to protect them. Relatives—parents and children, husbands and wives—were greatly attached to one another.

Parting with the dead was deferred as long as possible. The corpses, particularly those of children, were kept in the dwellings, the relatives watching and sleeping near at hand. Fear of the dead, at least of related dead, was unknown to the Aleut, since they conceived of those departed, not as hostile spirits, but as the same loving beings they were in life.

Under such circumstances it is scarcely to be wondered at that the Aleut learned to mummify the bodies of their dead, thus making their preservation possible, and postponing the time for final disposal,

which was effected mostly in dry caves. The corpse was arrayed in its best clothing, over which was drawn a waterproof shirt made of the intestines of sea mammals. Then the body was arranged in a squatting position—a favorite posture of living Aleut when resting—with knees drawn up to the chin. Wrapped in closely plaited grass-mats and seal or sea-lion skins—for a man these were taken from the cover of his boat—the corpse was lashed into a compact bundle with thongs or seaweed ropes. The whole was wrapped in a net made of sea-lion sinew.

The folklore of the Aleut has been influenced by that of the Eskimo, the North Pacific Coast Indians, and also of the Palæ-asiatic tribes of northeastern Siberia. There are, however, many genuine Aleut tales which relate to animal guardians, or we may say, to personal totems. Every ancient Aleut received from his father or a shaman, an animal protector or *ugdux* in the shape of an animal's skin. This was worn in times of danger, struggle, or contest, to help transform the wearer into the corresponding animal, and thus receive its protection. The Aleut had many colored wooden masks representing animal and human monsters, which were worn during religious and social dances and festivities. The dances were actually dramatic presentations.

The conversion of the Aleut to the Greek Orthodox Church, which was consummated in the time of the missionary Veniaminoff (1823–1833), resulted in the obliteration of old institutions, beliefs, ceremonies, and customs. Veniaminoff put an end to the cruelties and exploitation practiced by the Russian hunters and officials against the Aleut. In Unalaska there is a comfortable Methodist home for Eskimo and Aleut children. But even impoverished Aleut parents would not allow their children to live in this home. Orphans placed there by the American authorities would return to the Russian Church after they had grown up and had left the home.

It is touching to observe how poor Aleut hunters and laborers will give their mite to embellish their churches with candelabras and lustres, and with icons and saints painted in Russia by good painters.

When I was among them, the Aleut were teaching one another to read prayers

A HUNTER OF ATKA ISLAND

A rain shirt of seal intestines and waterproof boots of sealskin protect the hunter from the elements. Behind him may be seen a skin boat of the one-hatched type

A MIXED-BLOOD ALEUT-RUSSIAN WOMAN
Her children show a reversion to the Aleut type

in the Church-Slavonic language, incomprehensible to them, although the prayers are translated into Aleut and English. Once a year the Russian priest of Unalaska would visit the distant western settlements of his parish to administer the Communion and perform marriages and rites of baptism; but during the whole year there was a reader in each village who read in the local chapel not only prayers proper for laymen, but also the entire Mass, which usually is done only by a consecrated priest. The whole community formed the choir.

SOCIOLOGY

While the Aleut beliefs fully capitulated to Christianity, some ancient family customs have survived to the present. Of course this is not obvious to the casual observer, but the curtain may be lifted when the investigator knows the language of the people. With this in view, I devoted the first year of my stay among the Aleut to the study of their language. I found many ancient marriage customs still surviving — both polygyny and polyandry being practiced in the case of a man living with the younger sisters of his wife, and of a woman living with the younger brothers of her husband. In olden times a man might have as many wives as he could provide for and a woman as many husbands as she could keep house for. But this individual liberty in marital relations does not mean that there was no real love or jealousy; the contrary may be learned from ancient Aleut tales.

SOMATOLOGY

During historical times the Aleut have intermarried with Russians, and after them, to some degree, with other whites, chiefly Americans. But this interbreeding has had little influence on the original physical type. Among the Aleut we encounter some bearded men and light-complexioned and light-brown-haired women, but on the whole the Aleut have preserved their original somatological traits. Many of them have the dark skin color, broad faces, and Mongoloid eyes of the original stock. The cephalic index of the living corresponds to that of the skulls of ancient Aleut. The measurements of 138 living people (men and women) taken by Mrs. Jochelson gave a cephalic index of 84, with a standard deviation of 3.3, and the measurements of 50 well preserved skulls from prehistoric graves gave an average cephalic index of 82.1, with a standard deviation of 2.7. According to Broca, 2 units may be added

to the cephalic index of skulls to obtain the cephalic index of the living. Adding, 2 units to 82.1 (cephalic index of our Aleut skulls) we obtain 84.1.

THE ALEUT LANGUAGE

The Aleut language is divided into three dialects:

(1) The eastern, or Unalaskan.

(2) The central, or Atka.

(3) The western, or Attu.

The Unalaska dialect is spoken on all the islands to the east of Umnak (Umnak included) and by the Aleuts of the Alaska Peninsula. The Aleut language belongs to the Eskimo stock. It has been impossible as yet to make a detailed comparison of my extensive Aleut dictionary with the published Eskimo vocabularies, but even a superficial survey of the latter shows many common elements. I analyzed the grammar of the three dialects of the Aleut language and found its structure is based on the word formation common to other Eskimo dialects. The modification of Aleut verbs, with its two formal processes of incorporation and polysynthesis, characterizes, perhaps in the best way, the Eskimo-like structure of the Aleut language.

I have already mentioned the influence of the missionary, Veniaminoff, on the beliefs and life of the Aleut. Since Veniaminoff's time the Russianization of the Aleut proceeded so rapidly that, had it not been for the purchase of Alaska by the United States in 1867, the Aleut language would have long ago ceased to exist, and would have been replaced by Russian. But the U. S. Government, after acquiring Alaska, left the Aleut to themselves for a long time. During this period the Russian influence ceased and the American had not begun. The Aleut gradually forgot the Russian language, with the exception of reading (but not comprehending) the Church-Slavonic used in the church service, and returned to the tongue of their forefathers. Thus the Aleut language was preserved in the elder generation until our day. Only after big commercial interests had gained ground in Alaska and a governorship was established, did the United States Government turn its attention to the matter of the enlightenment of the Aleut. This was in the middle of the eighties of the last century. Although at present not all the

A WOMAN OF UMNAK ISLAND

The baby is carried on its mother's back in a skin cradle, made soft and snug with a lining of fur, while the mother's coat is fashioned of birdskins, with the downy side turned inward

A GENERAL VIEW OF THE VILLAGE OF NIKOLSKOYE, UMNAK ISLAND
The red and the dog salmon that ascend the river are caught in traps consisting of two fences, one of stone and the other of wood, stretching across the stream

Aleutian Islands have American schools, the young Aleut already have an imperfect knowledge of their native language and the time is not far off when it will be entirely replaced by English.

SALMON DRYING ON ATTU ISLAND
The fish are split and hung on racks to dry before being stored away for the winter's food. This work is entirely the responsibility of the women and children

MATERIAL CULTURE

Since the separation of the Aleut from their Eskimo kinsmen of the American continent, their material culture changed, owing to differing climatic and other conditions.

The Aleut have no driving dogs or other domestic animals. All the settlements are situated on or near the shore, and communication between them is by means of skin boats and sometimes by walking. The ancient Aleut used skin boats with a single hatch, but very seldom did a hunter venture alone into the open sea. They hunted in pairs or groups in order to help one another in case their boats capsized in the rough waters. At present most of the Aleut skin boats have two or three hatches. Nevertheless, seldom does a single boat venture into the sea.[1]

On land small bows and arrows were formerly used to shoot animals in their rookeries. These were employed also against landing parties of hostile warriors. The Aleut of the Alaskan Peninsula, how-

[1]The ancient Aleut also had large skin boats called by the Eskimo *umiak*, but they are not in use at present on account of the lack of skins of sea lions or other large sea mammals.

ever, lacking firearms, still use the bow in hunting wild reindeer, bears, and other land animals. When sea mammals are hunted from boats, light darts cast by means of throwing-boards are used. These are thrown with the right hand, while with the left the hunter steadies the skin boat by holding the double paddle across it. For stringing a bow both hands are necessary, and besides, the bowstring recoils when released, and if used in the light skin boat, the craft might be capsized. Eskimo hunters likewise use the bow only when hunting land animals. The force of a thrown weapon in flight is considerably less than that of an arrow shot from the bow.

As the sea surrounding the islands does not freeze, the Aleut are not acquainted with the Eskimo method of hunting aquatic mammals through ice-holes or from floating ice-cakes. Therefore, some of the Eskimo winter-hunting implements were not developed by the Aleut. These were the composite bow, hooks for catching ice-blocks, ice-scrapers, bone picks for making ice-holes, snow-knives, snow-beaters, snow-shovels, ice-scoops, snow-goggles, and snowshoes. In the Aleut excavations no crescentic stone lamps and no lamps with bridges for the wicks were found. The Aleut did not cook over the stone lamps. The absence

THE FINAL STAGE IN PRESERVING THE SALMON

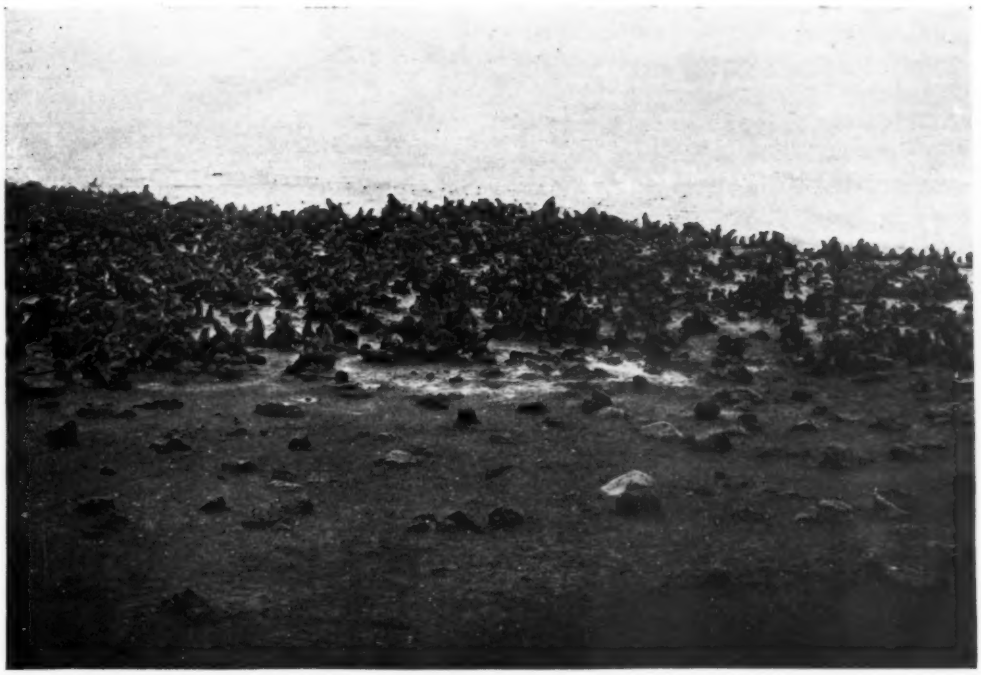
Sea-lion stomachs are cleaned, dried, and used as storage receptacles for the dried salmon

PREPARATIONS FOR THE SHORT WINTER

The skin coverings are stripped from the boats and stored under shelters to protect them from the winter gales. Otherwise they would dry out and break

A GROUP OF ALEUTS, UMNAK ISLAND, CLUSTERED NEAR ONE OF THEIR EARTH HUTS

TOSSING A GIRL ON A BLANKET (INSTEAD OF A WALRUS HIDE). A GAME KNOWN ALSO AMONG THE AMERICAN ESKIMO AND SIBERIAN CHUKCHEE



A LARGE SEAL ROOKERY ON THE ISLAND OF ST. GEORGE

ON THE PRIBILOF ISLANDS SEALING IS CARRIED ON UNDER THE UNITED STATES GOVERNMENT. ONLY MALE SEALS FROM TWO TO FIVE YEARS OLD ARE TAKEN

in the excavations of large stone axes may be explained by the complete absence of growing trees. For splitting pieces or logs of driftwood along their length, bone wedges and stone hammers were sufficient, and for chopping these splinters they used small stone adzes. Neither did the Aleut adopt the Eskimo type of pottery, which consisted of vessels and lamps of burned clay. The ancient Aleut consumed food either raw or roasted on stone slabs.

The art of weaving has been well developed by the women. Some of the objects woven from the split blades of *Elymus mollis* are so finely plaited that they have the suppleness of silk.

CULTURE FEATURES SIMILAR TO THOSE OF THE ESKIMO

The typical large slate tailoring knife (*ula*) used by the women was found in all the excavations on the Aleutian Islands. The Aleut call it *igadax*. The method of ornamenting bone objects by engraving them in geometrical designs with stone engravers and awls, and then filling the depressions with paints of different colors, is like that of the Eskimo. Of the Eskimo type also are the modern Aleut realistic representations of animals engraved on bone objects, and the realistic carvings in bone and wood.

CONCLUSION

Of all the uncivilized peoples I have studied in Siberia and Alaska, I feel most sympathetic with the Aleut. They endure physical suffering and privations without complaint; they are simple in their behavior, unselfish, friendly, and perfectly reliable. They have a sense of self-respect, and are reserved toward strangers. Backward they may be, but admirable they certainly are.

INTERIOR OF THE GREEK CATHOLIC CHURCH, UNALASKA

The priest is standing beside the entrance to the inner sanctuary, the doors of which are opened during the celebration of the Mass. This entrance is called in Russian "The Czar's Door"

SAILING DOWN THE MOONLIT WATERS OF THE YALU RIVER

WINGS ON THE YALU

By WILLIAM DOUGLAS BURDEN
Trustee of the American Museum

AT Peking, where I was to join Mason Sears for a pursuit of the great Asiatic sheep on the Sino-Mongolian frontier, I heard of conditions on the Yalu River, border of Manchuria, which sent me off at once on a hurried preliminary trip.

I had been given to understand that there were millions and millions of ducks and geese down on the lower reaches of that river in September, and, although I could not verify the statement in Peking, the prospect was so inviting that I decided to go. Accordingly I wrote of my intentions to the American consul at Antung.

The Yalu River forms the boundary between Manchuria and Korea. The Port of Antung is on the Chinese side of the river, but, to all intents and purposes, the Japanese control the city. They own the silk which is exported in such large quantities, and they own the lumber which comes down the river from the Manchurian forests to the northward.

The natural beauty of Antung itself is nothing to boast of, and the sight that greets your eyes when you get off the train at five o'clock in the morning may well be left undescribed. A rickshaw was at hand, and I proceeded to the "Eagle's Nest"—the American Consulate—a little hovel situated on high above the city, of which we should properly be ashamed. Mr. Langdon, the consul, met me at the gate, and I was delighted to find that all necessary arrangements had been made for a trip to the mouth of the river.

A few hours later we were on our way, Langdon and I sprawled out on the deck of our sampan, while a pair of "missing links," who squatted on their haunches in the stern, guided our craft through the maze of junks that lined the bank four and five rows deep. The sampan was ours for three days at approximately fifty cents a day, and the luxury we enjoyed was in proportion to expense. We hoisted sail and the wind and tide helped us on our way.

The river life was fascinating. Here coolies were unloading lumber, chanting as they worked. Never have I listened to such cadence or swing. It sounded almost

JUMPING OFF INTO GURGLING MUD
Yachting on Long Island Sound and junketting on the Yalu have nothing in common, but the latter is worth trying

like a roundelay, with a soloist to give the cue. Russian boat songs are famous for their sweep and rhythm, but nothing could be more enthralling than this singing on the Yalu River. When a large number of men sing as they work, the energy that they put into their work is revealed in the song, and the rise and fall of hundreds of voices, coming across the water from a distance, is thrilling.

Other junks, laden to the water's edge, were being towed upstream by means of ropes attached to the bank, and every heave was accompanied with a renewed burst of song. But all this activity I am describing was Chinese. The lazy Korean anchored his boat and sat motionless, pipe in mouth and cage-wire hat on head, and waited for the turn of the tide.

By the middle of the afternoon we had reached the flats, and here we beheld a most extraordinary thing—countless millions of birds. As Langdon said, it was the sort of thing you read about, but seldom see yourself. Sometimes the sky was black with geese, and sometimes black with ducks. Sometimes it was the water that was covered with them in every direction as far as the eye could see, and sometimes the flat mud marshes for miles on end were alive with moving bodies. When all the geese flew up together, the noise of their wings filled the air, sounding one moment like an express train and the next like some gigantic waterfall. It was a paradise for the ornithologist; I don't believe that there is anything else in the world like the lower reaches of the Yalu River in late September.

We hunted till dark. We had no "blinds" of any kind, so the hunting consisted largely of wading around knee-deep in the softest kind of mud, scaring up the birds as we went. It was almost hopeless—a real "wild goose chase."

With millions of targets dangling before our eyes, it was astonishing how hard it was to score a kill. When there was sufficient cover in the form of long grass and reeds to use as a blind, the only geese that

flew over it were high out of range. We had to lie down in the soft, wet mud and, while trying to resemble a log, crane our necks in every direction to be ready for any bird that happened to come close enough for a shot. When a bean goose was seen coming over, we would wait till the very last moment before making a move. Then we would jump up and shoot as quickly as possible. By the time we could fire, however, the goose would already have turned. Under those conditions, the satisfaction of seeing a great gander come tumbling out of the sky with a flop into the mud can well be imagined. It was shooting under difficulties, but before dark we got about eighteen birds—Asiatic duck, mallard, teal, and geese,—and we had worked hard for every one.

At sunset, tremendous flocks of ducks, stretching out sometimes for a quarter of a mile in the sky, went whirring overhead—always too high—and away into the west. Flock after flock came by in endless succession, teal and then mallard, then Asiatics and more mallard. Away they went, with the speed of the wind, into the sunset. One could keep them in sight for several minutes, a scattering of black dust against the crimson sky, and then they would swing south on their great migration. Thousands upon thousands upon thousands of duck must have left the marshes that evening. As it grew dark, one could no longer see, but one could still hear them—the whistling of millions of wings passing overhead.

Finally we slopped back in the mud to our sampan, and crawled up on the ridiculous little craft. Most of the mud came with us, and Langdon's setter took care to shake himself over everything. We were soaked through and caked with mud from head to foot. A cold wind came off the marsh. There was absolutely no prospect of our getting clean or warm, or of satisfying a ravenous appetite. When it got too cold on deck, we crawled

ON THE YALU RIVER

Man may well have separated from the anthropoid stem many millions of years ago, but who can fail to note in these prognathus jaws and in the character, facial expression, and pose of the gentleman at the right, an unmistakable simian resemblance

down into a black manhole which in every way resembled a coffin. All sampans have these miniature dungeons below decks, and they are cunningly contrived in true Chinese style so that they are too low for one to sit up in and too short to lie down in. Moreover, when the lid is on, not a breath of air can get in. Langdon and I found ourselves trying to eat supper by candlelight in this den. I almost lost my appetite when I saw hundreds of shiny-backed cockroaches of all sizes crawling over the place. The prospect of spending the night with roaches that were compan-

A PARADISE FOR THE ORNITHOLOGIST

When cold storage shipping methods were introduced in China, the slaughter of game birds in the Yangtze valley was without parallel. Fortunately the mouth of the Yalu River is still a safe stopping place for these migratory birds

ionably inclined did not seem conducive to sleep, but none the less it was managed. Lao Li (Old Forest) and his assistant boatman could do nothing to make us comfortable, for neither of us could give orders in Chinese, and, needless to say, they were unable to understand a word of English. It pleased them to observe the foreigners shifting for themselves.

As I dozed off to sleep, I could still hear geese honking on the mud flats—just a jumble of sound it was, broken occasionally by the wild cry of some lonely gander flying low overhead in search of a night's resting place.

At the earliest streaks of dawn we were awakened by a terrific bombardment of firecrackers from a near-by passing junk. The coolies, I was surprised to see, held the explosives in their hands as they went off, and there was much talk and bickering over it all. Langdon felt certain that "Chinese man catch plenty face" shooting off firecrackers. This craving for face he thought was the cause of the bombardment. After a few minutes' observation, however, I became convinced that the cause was simply an incurable but completely childish passion for noise.

We were on our way again long before sunrise. Jumping off the sampan on a cold misty morning into gurgling muck was far from pleasant. The tide came in so fast that before long we were waist-deep in water. Soon it became advisable to retire to the sampan. Moreover, it was just as well that we stopped hunting, for we were losing most of the birds that

GEESE, GEESE, EVERYWHERE
The whirring of millions of wings filled the air, sounding at one moment like an express train, and the next like some gigantic waterfall

we killed. One incident of our experience will give an idea of the great quantity of geese. We had a rifle along, and, shortly after reaching the sampan, Langdon put up the 500-yard sight and took just one shot out on to a stretch of water that was black with birds. When we reached the spot, lo and behold, a dead gander was lying on the water, with a bullet through it!

After a while the tide dropped a little, and we succeeded in bagging several more geese before we started home. Langdon had never hunted the marshes before, but it was easy to see that if one studied them carefully and took pains over equipment and put up blinds, the shooting there could not be equalled anywhere in the world.

On our way back to Antung night overtook us, and the moon sailed out among billowy clouds. Great lumber rafts came swinging down river in the gloom. These rafts are of giant size—in scale an acre or so. The Chinese build huts and have open fires on board. We passed an almost endless succession of loaded junks with sails set, slowly making their way up or down the river. Sometimes crowds of Chinese were singing roundelays on deck, and as the sound would grow faint in the distance, the elusive beauty of it seemed to slip out of reach on the night wind. We sat listening intently. There was a gentle ripple on the water, and I remember distinctly one junk that sailed right across the path of the reflected moonbeams, with her beautiful square-ribbed sails gracefully swollen in the breeze. The sound of singing came pulsating now faint, now strong, across the water, and it seemed that in that single picture was reflected all the romance of the East.

We reached Antung at midnight, and with bag and baggage over our heads, wandered up through squalid narrow streets till we secured rickshaws. When we arrived at the Consulate, it was doubly guarded by Chinese soldiers. The bandits (Hunghutze) or red-beards had been creating a disturbance in the Chinese quarter—the very section through which we had just come with all our goods and chattels on our heads.

THE CAVE TIGER OF AMOY

The Story of a Hunt for a Man-eating Tiger that Lived in a Rocky Den Back of Amoy

By WILLIAM LORD SMITH

DURING two years of hunting and studying tigers in Asia my most interesting experience was with the cave tigers of Amoy. It is not often that one gets an opportunity to hunt such animals as these in caves, and crawling into a tiger den below the surface of the earth adds a thrill that is entirely lacking when one hunts these animals in the jungle.

In southeastern China the forests passed ages ago, and there remains today a bare, low-lying country studded with bowlder-covered hills. Often these scattered rocks reach enormous size—twenty feet or more in height—and in the caves formed among these huge and tumbled blocks, the tigers live.

Why the tigers remain in such a God-forsaken land it is hard to say, but they are there in goodly numbers. At night they prowl about the country-side, visiting the scattered villages in search of dogs and pigs and human victims. So comparatively easy is it for these powerful beasts to capture and devour the defenseless natives that practically every tiger is a man-eater.

Certain well defined methods of hunting these tigers have been developed by the people of the country, and it was the local method that I adopted. When a tiger has made a kill, one is able to follow his blood trail across country and into the rock tunnels in which he has taken shelter. There, with luck, one is sometimes able to find him in some recess in the rocks from which there is no second opening through which he can escape, and there, by the light of flaring natives torches, one must shoot him from a distance of fifteen or twenty feet. The native hunters are armed with short trident-like spears, and the torches are made of splintered and dried bamboo.

My head man was Taikoff, a most efficient person, even though we had to converse in pidgin English and the few Chinese words that were at my disposal. He was loaned to me by an English friend in whose house he served as cook, but on the trail he proved to be brave, determined, and of tremendous value in handling the natives we hired. He was subtly able to influence the hunters to obey him even against their wills, and he was at least as efficient in extracting money from me.

It was Taikoff who collected the coolies we required, and we started gaily off up country, confident in the belief that we would obtain our tiger in short order. En route we slept in temples, for they are constantly used as stopping places for travelers. Thus a tent was no part of our equipment, and we put up each evening in some little temple or other, sometimes at the feet of a weird god, beneath whose benign or ferocious gaze we calmly went to sleep.

The trip to the tiger country did not take long, and when we reached it we immediately set about exploring cave after cave, although our efforts met with no success. The Chinese round about soon learned why we were there, however, and word began to come to us from various sources, telling us where tigers had been seen, with the result that we moved from village to village in pursuit of rumors rather than of tigers. We tied goats in what appeared to be tiger districts, leaving them to attract the beasts, but we in-

variably returned to find the creatures unharmed. So consistently did this happen that we finally reached the conclusion that the tigers had somehow obtained word concerning us, and had all decamped.

So regular and frequent were our failures that my hunters at last began to comment, and finally began to break out in open meeting. They saw no chance of bakshish under the conditions that prevailed, and were unwilling longer to pursue so unremunerative a course. Taikoff, however, brought all his persuasiveness to bear, and despite their displeasure, they decided to remain.

We hired a Chinese houseboat and rowed the old tub up a near-by river. The two children of the owner of the craft—a boy and a girl—did most of the work, except when I lent them a hand now and then. As a matter of fact I became a great companion of these youngsters, who seemed to expect nothing but hard work. In that they were not disappointed, yet they were always cheerful, and performed their tasks as if they never dreamed of objecting. Our days on the river in the warm March sunshine were delightful, and the varied assortment of coolies, hunters, and river people mingled merrily together.

One night we moored the boat near an old stone bridge, while Taikoff and I went back into the country to a cave which we watched until late in the evening in the hope that a tiger would appear. We hid ourselves among the rocks and kept our eyes on the entrance to the tunnel, hoping against hope to see one of the beasts which,

THE HUNTING PARTY

Coolies, hunters, and river men made a merry company on the old houseboat, while traveling with Doctor Smith up river to the tiger territory. The two children of the owner did most of the rowing, except when Doctor Smith lent them a hand Note the sail made of matting, which is rolled up out of the way when not in use

ON THE MARCH

On the long tramps over country, desolate except for a few squalid villages near the rice fields, coolies solved the problem of transportation. They marched to the sound of their voices chanting in cadence with the rise and fall of their loads fastened to the ends of pliant wooden rods

by now, I had set my heart on obtaining. But watch though we might, no tiger appeared, while the cooing of wild pigeons alone broke the stillness of the solitude. It is lonely business waiting around in the evening for a tiger, and I must admit that I would have given up had it not been that Taikoff was so confident. The result was that we stayed until dark, but despite our patience no tiger came into view, and ultimately we trudged back to the boat, while I began to wonder whether the tigers of the vicinity were realities or were nothing but the figments of Chinese imaginations.

A little farther up the river we parted with our houseboat and its jolly family, the coolies took up their loads again, and with Taikoff in the lead, we turned away from the stream and began a march toward the south. The country was desolate except for a few squalid villages on the lowlands near the rice fields. Massive rocks covered the low hills, and it seemed that cave tigers certainly must dwell hereabouts if they dwelt any place. The wretched people, gaunt from malaria, were a lot of brigands. A fight was going on between two villages, and they wasted more than a little powder on one another, but fortunately their ancient matchlocks did not seem to do any particular damage.

Tigers were plentiful, we were told. The creatures raided the villages constantly, and people were attacked and killed frequently. At night every house was locked tight, which proved that even if the stories of tigers were false, at least the people believed what they told us. We began to take a renewed interest in our hunt, and finally fell in with the headman of the country, who promised to take us to a monastery back in the hills where, he said, there was a never failing supply of tigers. He seemed reliable, so we took his word, and with him to guide us, we made our way, during all of a long

afternoon, into a district wilder than anything we had yet seen.

Big rocks were scattered about everywhere, often being piled up in menacing citadels. Amid these the small monastery was set, surrounded, it seemed, with chaos. Certainly no more fitting place could have been selected as a tiger's stronghold, but it was a curious place for priests to live, especially if tigers were common in the neighborhood. Still, a Buddhist monk has an almost unique disregard for life. His thoughts are fixed on the future, and what is about him seems to matter but little.

"Where is a likely place for tigers?" we asked, and the priests, without hesitation, pointed to a huge mass of rocks four or five hundred yards away. Beneath those rocks was a cave, they told us,—an ideal home for tigers and one that was seldom vacant. But that kind of story was more or less familiar to our ears and I, for one, was not entirely convinced, when, to my amazement, a tiger crawled out of a tunnel at one end of the hill, and crouched upon a rock.

That I was surprised goes without saying, but I was pleased as well, and despite the fact that the crouching animal commanded a full view of the land between us, I decided to take the chance of stalking him with a single hunter as my companion. I looked to my rifle, and we began our advance, but before we had come within range of him he suddenly disappeared. I had hardly expected to get him, of course, but I was disappointed just the same, especially as evening was almost upon us, and we were forced to return to the monastery. Here, after supper, our party packed themselves away for the night, after having picketed two goats near the entrance to the cave.

We were abroad early the next morning, and our first inquiry was concerning the goats. An investigation showed that they had been killed and dragged some

A BUDDHIST TEMPLE

In China the Buddhist temples make good temporary night shelters for the wayfarer—and the altar gods within smile down alike on all races of men—be they yellow or white

TIGER HILLS
Above Chinese paddy fields stretching to the sea arose menacing citadels of rock—where the man-eaters lived

distance up the hill. Now we were forced to explore the cracks and crannies and caves among the rocks, for obviously no tiger would be in the open in broad daylight. The men, consequently, lit their torches, while Taikoff and I, from the very top of the rocks, covered the district pretty thoroughly with our rifles.

For half an hour the search went on. and then a series of shouts warned us that the tiger was on foot. We could see the spears of the hunters pointing down hill, and we scurried and slipped over the rocks in the direction the beast seemed to have taken. I was down between two bowlders when suddenly he bounded by within fifteen feet, although a rock intervened and I did not see him. We found his tracks in the soft earth between the rocks, but a rain came up just then and the men, claiming that the water would put out their torches, refused to continue the hunt. Reluctantly I gave in, and we returned once more to the monastery.

Another tiger came to our hill the following night but left before sunrise, perhaps because he disliked the smell of smoke that lingered in the tunnels the coolies had traversed. However, he left tracks that were plain enough, and we followed them. They took us past the monastery to a patch of gravel-strewn land, where we lost them completely, but like hounds that had lost a scent, the hunters cast about in every direction. For an hour or more they searched, but never another footprint did they find. He, too, had escaped.

Very much disheartened by now, we pushed on. A quarter of a mile from where we had lost the tracks, a ravine barred our way, and into it the men climbed, encouraged. The place was twenty or twenty-five feet deep, the walls were weathered into cracks and little caves, and the floor of the ravine was

strewn with rocks. Into tunnel after tunnel the men thrust their torches, while I, from the edge of the place, kept as careful watch as I could, hoping to be able to see the tiger if he came out.

While I paced up and down the ravine edge, a young hunter shouted for me to join the party below, and Taikoff, who was standing in front of a black-mouthed tunnel, cried out in excited pidgin English that one of the boys had located a big tiger inside, and that the creature was crouched behind three human skeletons. Taikoff was apparently as happy as a boy just let out of school, for, he claimed, the tiger was as good as dead.

I was far less certain than he seemed to be, but everything was set for a good show, so I slid down the ravine wall, and approached the tunnel mouth. We had the ferocious beast penned in at last, but the cavern mouth was narrow, and there was some difficulty to be faced in approaching him merely by the light of a few flaring bamboo torches. No sooner had we reached the nook in which he had taken refuge than he squeezed through a narrow crack behind him, clawed his way to daylight, and was free again.

We ran back into the ravine, wondering just which direction the animal had taken. He, however, had no intention of running. Evidently angered by our invasion, he determined to make a stand and there, seventy-five yards away, he stood growling in the open, his tail threshing back and forth, his teeth bared. I took a deep breath and raised my rifle. For a moment I aimed, and pressed the trigger, but there was no report. I looked quickly and saw that the safety lever was on, but before I could switch it off, the tiger, with

THE TIGER'S STRONGHOLD

Never was such a hunting ground in which to play hide and seek with a tiger. While the men drove the tiger through caves and tunnels Doctor Smith and his head man tried to cover all avenues of escape with their rifles

a parting growl, leaped away, while I, with a snap shot, managed merely to cut the flesh of his right hind leg.

Past the monastery he galloped, and up to the hill of rocks where he had passed the night, and we, pell mell, followed after. We slowed up on reaching the hill, however, for the tiger might be waiting for us behind any one of the big rocks. We located his tracks in one spot, and promptly climbed to the top of the hill, keeping a sharp lookout us as we struggled upward.

By this time the Chinese of the whole country-side had joined the hunt. There were scores of them—hundreds, perhaps. They swarmed over the hill, jumping from rock to rock, shouting joyfully to one another, and were apparently entirely indifferent to the fact that a really dangerous animal was at large, and might, at any moment, leap upon someone. It was exasperating for me, but obviously it was great fun for the Chinese, though the hunt was plainly ruined.

The tiger—new to such a proceeding—suddenly appeared. A hunter pointed out his head to me, down a tunnel. For a moment the beast shrank back, and then, gathering confidence, rushed toward us with a tremendous roar. Several hunters, far more courageous than one might imagine possible, dashed toward the creature with their short spears held before them. Roars from the tiger and cries from the men filled the air. It was a splendid sight, this clash of primitive forces in man and beast. The men thrust with their spears. The tiger, growling deeply, spat at them. A spear was thrust into his very jaws and he shrank back in pain,

VANQUISHED

The native hunters, armed only with their tridents, unhesitatingly entered the caves among the bowlders, thrusting flaring torches of bamboo before them. By this method they located the tiger and drove him out

A VICTORIOUS PROCESSION

When the magnificent beast was finally killed by a bullet from Doctor Smith's rifle, the entire concourse of Chinese crowded about—those who had until then treated the hunt as a joke being the most eager to carry the booty back to headquarters. The animal tipped the scales at 385 pounds

and astonished, no doubt, at the attack. For a moment he tried to stand his ground, but the odds were too great. He snarled savagely and, as the hunters shouted and advanced, the tiger suddenly leaped away, disappearing once more among the rocks.

The hunters shouted louder than ever, rehearsing the whole scene. They struck the air madly with their spears, crying at the tops of their voices and trying, now and again, to imitate the deep, throaty growl of the animal. All about was bedlam, but Taikoff sat down as calmly as if he were at a picnic—an attitude that I could not imitate. For some time he waited patiently for the men to cool down. Little by little they did, and Taikoff began talking with them quietly. At first they refused to go farther with the hunt, but somehow, with the persuasiveness that was his, Taikoff gained his point. After much talking, which was meaningless to me, they picked up their torches, lit them once more, and with their spears held before them, slid down into the hole in the rocks into which the tiger had disappeared. I watched them until the blackness swallowed them up, and then, with Taikoff, I began circling the hill so as to keep informed of any operations that might take place above ground.

We were now completely out of touch with the hunters. Where was the tiger leading them? Filled with fear of the torches, the beast, no doubt, was gliding noiselessly through the dark labyrinths of his home, with the men in hot pursuit. A flash of orange and black caught my eye between two rocks. It was gone the instant it appeared, yet obviously it was the tiger. There was not a sign of the hunters. Even the villagers were not in that immediate vicinity. Only dull gray rocks lay tumbled all about, and deep between two of them the tiger had momentarily appeared. I wondered what I should do next, but before I had

ARE THESE TIGERS LOSING THEIR STRIPES ?

It is supposed that the tiger originally came from northern Asia, where the most successful coloration was one made up of long dark stripes to imitated the shadows of the trees in the districts be inhabited. The Chinese tiger of today has a broken coloration of short black dashes and rosettes which imitate well the shadows among the bowlders where he lives

decided, a deep roar came from the rocks behind which the beast had disappeared, and almost before the roar was ended the tiger leaped into sight.

This time I was ready. My sights caught his head and I pulled the trigger, while the crack of the rifle was hardly to be heard above the reverberations of another roar. The beast stopped short in his stride. His muscles gave way and he fell on his side. He quivered for a moment and I caught the movement of muscles beneath the flame-colored skin. For a second the whole body remained tense, and then relaxed. The handsome animal lay dead.

The whole concourse of Chinese crowded about while I took some photographs. Then we weighed him. The balance stopped at exactly 385 pounds, a goodly weight. As we stripped off the skin, the Chinese begged for the tiger's blood to drink and his flesh to eat, for according to Chinese belief, there would thus pass into them the strength and courage of their foe.

Now that we had secured our tiger, we quickly packed up our outfit and started for the river, whence we sailed for Amoy.

THE INTERNATIONAL CONGRESS OF AMERICANISTS

A Scientific Body Especially Concerned with the Study of the Aboriginal Population of the New World, that Will Hold Its XXIII Session at the American Museum of Natural History in September

By CLARK WISSLER
Curator-in-Chief, Division of Anthropology, American Museum

WHEN Columbus returned to Spain with the startling information that across the Atlantic were new and strange peoples, the scholars of Europe found themselves face to face with a number of perplexing problems. The Indians, as the native inhabitants of these newly discovered lands came to be called, spoke in strange tongues and bore little resemblance to any other known people. Ever since that time many scholars in Europe and later in America, have gathered information on the languages, modes of life, and the past of these unique native peoples.

The first serious students of Indian life were the Catholic and Protestant missionaries to the Indians, many of them the most scholarly men of their generation, and it is to the most learned of these that we owe the first reliable records of native languages, the exact location and number of living tribes, etc.

One of the great questions challenging the scholarship of the time was to discover in what way these Indians were related to the races of the Old World, and how and when their ancestors reached America. These questions still puzzle the scholars of Europe and America, but in the meantime a great deal has been learned about these natives, and archæologists have been able to recover some of their history, so that the answer to these fundamental questions may be forthcoming in the near future.

As we have said, the scholars of Europe were, from the first, greatly interested in the American Indian, and so quite naturally, it came about that in 1875 an international society was organized to promote research in this field. The first meeting of the society, now called The International Congress of Americanists, was held at Nancy, France. Its purposes, as stated, are to contribute to the progress of the ethnological, linguistic, and historic studies related to the two Americas, especially in regard to the period before the time of Columbus.

At a meeting in Paris in 1900, the subjects for study were reaffirmed as follows:

(1) The races of America and their relationship to other peoples.

(2) The archæological remains found in America, and time relations as revealed by them.

(3) The habits and customs of the various groups of American Indians, and questions of the origin and distribution of these in the Old and New Worlds.

(4) The native languages of America.

(5) The early history of America, especially in regard to its discovery and early settlement.

(6) Geographical and geological questions, especially as related to prehistoric human activities.

For about twenty-five years after its founding, the meetings of the Congress were held in Europe, gathering successively in the capitals of the leading nations, but in 1900 this policy was changed, and it was decided to hold each alternate meeting in the New World. Since that time the Congress has met in Mexi: »

South America, Canada, and the United States. In 1902 the Congress met in the American Museum, and Morris K. Jesup, then president of the Museum, was its Honorary President, so designated in recognition of his generosity in supporting extensive researches in all lines of anthropology. The only other session of the Congress in the United States was held in Washington, D. C., in 1915.

Unlike many other scientific bodies, the Congress of Americanists is looked upon as under governmental auspices. Thus, it is usual for the executive head of the country in which it is held to act as the patron of the Congress. What logically follows is that invitations are sent through diplomatic channels, asking that the respective governments each designate and send official delegates to represent them at the Congress. For example, when the Congress met in Washington, D. C., in 1915, President Woodrow Wilson was the patron and the late Hon. John W. Foster presided. The character of the patronage and the presence of delegates representing the governments of Europe and North and South America, add special dignity to the proceedings.

President Henry Fairfield Osborn of the American Museum is the Honorary President of the XXIII Session of the Congress, to meet at the Museum during the week beginning September 17. The sessions are, however, under the joint auspices of the American Museum of Natural History, Columbia University, the Brooklyn Museum, the Museum of the American Indian (Heye Foundation), the American Ethnological Society, the American Geographical Society, the New York Academy of Sciences, and the Archæological Institute of America.

The headquarters will be at the American Museum of Natural History, but meetings will also be held at Columbia University, the Museum of the American Indian (Heye Foundation), and the Brooklyn Museum. A large number of distinguished scholars are expected, among them Baron Erland Nordenskiold, who has devoted years to research in South America; Captain Thomas A. Joyce of the British Museum; Mr. Lewis C. G. Clarke of the Museum of the University of Cambridge, England; Professor Louis Capitan of France; Professor William Thalbitzer of Copenhagen, an authority on the language of the Eskimo; Professor Kaj Birket-Smith, who will report the results of the Thule Expedition led by R. Rasmussen; Hofrat Franz Heger of Vienna; Father Koppers, editor of *Anthropos;* and Professor G. V. Callegari of Verona, secretary of the XXII Session of the Congress.

From South America, Doctor Jose Toribio Medina will represent Chile; Professor Julio Tello is a delegate from Peru. Dr. Salvador Debenedetti and Dr. Felix Outes are expected from Buenos Aires; Dr. Manuel de Oliveira Lima of Washington is to represent Brazilian institutions; and the Minister of Education of Mexico, Dr. Manuel Puig y Casauranc, will head the delegation from Mexico.

PLINY EARLE GODDARD
1869-1928

By N. C. NELSON
Curator of Prehistoric Archæology, American Museum

THROUGH the sudden death, on July 12, of Pliny Earle Goddard, curator of ethnology since 1909, the American Museum sustains the loss of an able and energetic staff member.

Doctor Goddard was born of Quaker parentage on August 24, 1869, at Lewiston, Maine. In Maine also he spent his boyhood and received most of his preparatory schooling which, however, was completed at Union Springs in New York State. He was graduated from Earlham College, Richmond, Indiana, receiving his A.B. and A. M. degrees respectively in 1892 and 1896, doing some teaching in the interval. Shortly afterward he accepted service as missionary to the Hupa Indians of Humboldt County, California. Three years later, or in 1899, he entered the University of California, where he obtained his Ph.D. degree in 1904, having served in the meantime as instructor. In 1906 he was appointed assistant professor, a rank which he held until 1909, when he joined the American Museum staff as assistant curator.

DR. PLINY E. GODDARD
Curator of Ethnology, in the American Museum of Natural History

These are mere stepping stones in a man's life and we have time to examine the moss on only the last two of them. Doctor Goddard's specialty was Indian languages, and he devoted himself almost exclusively to the study of the dialects of the great Athapascan family scattered from Alaska to Mexico, including such tribal groups as the Hupa, the Navaho, and the Apache. As a result, seventeen professional papers of more or less extensive and monographic character are credited to him, ten of them among the University of California Publications in American Archæology and Ethnology, and the remainder on the list of the *Anthropological Papers* of the American Museum of Natural History. These major publications include linguistic texts, with translations, derived from the Hupa, Kato, Chilula, Sarsi, Chipewyan, Beaver, and Jicarilla Apache Indians. There are also several phonological and morphological expositions and, lastly, some three or four descriptive papers relating to social and material aspects of Indian culture. His first and perhaps his most readable paper, which was also the initial publication of the University of California series, is entitled "Life and Culture of the Hupa."

After coming to this institution Doctor Goddard naturally gave a large share of his time to Museum problems and thus gradually all but lost contact with his

linguistic interests. Museum activities, in other words, compelled him to broaden out. In this new field he planned and arranged several of our North American halls, especially those exhibiting the arid Southwest and the Northwest Coast cultures. In later years he also revised the Asiatic Hall. He supervised the execution of three unrivaled habitat groups in the Southwest Hall and likewise several murals in the other halls. To complete his installation work he produced two model *Handbooks* giving the necessary background to explain the exhibits respectively in the Southwest Hall and the Northwest Coast Hall.

In addition to these major activities Doctor Goddard took part in many other lines of endeavor. Thus he made numerous and fairly strenuous field trips to the western states and to distant parts of northwestern Canada, besides other journeys to Peru, to Mexico, and to Europe. He was editor for several years of the *American Anthropologist;* he served various of our national and local organizations in different capacities; and during the last ten years or so he gave formal instruction to a large number of Columbia and Barnard students. Perhaps it is not out of place to add that he acted of late years as secretary to the meetings of the Museum's scientific staff. Besides all these professional labors, he found time to run a small greenhouse and to take a vital part in civic and community affairs at Leonia, New Jersey, where he lived. His last considerable undertaking was the secretaryship of the coming International Congress of Americanists in September, which will be seriously handicapped by his untimely death.

Such are some of the bare facts of the useful and interesting career of a man of distinctly high scientific ideals—a career well deserving of more comment than can be given in this place. But over and above all this rises Doctor Goddard's rugged strength of character, and withal his jovial—almost sprightly—personality. He had something of the nature of flint in his make-up and it was easily possible to draw fire from him; but it was only a flash and not a smoldering conflagration. He was fond of his children, five of whom—with his wife—survive him. He was intensely loyal to his friends and not at all averse to fighting his enemies. Finally, whether he realized the insidious character of his malady or not, he was ever a boy at heart, a good sport, and a first-rate camp fellow. Surely a man who passed so easily these last tests is in no need of further tribute.

NOTES

CENTRAL ASIATIC EXPEDITION

Dr. Roy Chapman Andrews reports most satisfactory progress in the following letter just received by the American Museum:

In Camp, Shara Murun, May 3, 1928

We are in the midst of our daily sandstorm and the dust drifts in so thickly upon my paper that it is difficult to write. We have been here for 12 days and never have I seen such infernal weather in Mongolia. Every day such terrific sand gales that we only sit in the tents while a yellow cloud swirls about us. Everything is a mass of sand—guns, cameras, beds—we are simply smothered in it. Nevertheless we have managed to put in some hours working and in spite of the storms have discovered some good things. Mac Young found a remarkable titanothere skull, quite unlike anything Granger or Thomson know. A river bed deposit has proved to be a rich quarry and bird bones, carnivore skulls, and many other things are plentiful.

We got through the brigand area without trouble. We spent one day near Tserin's place while I visited a Mongol prince, Sunnit Wang, in whose province I want to pasture our camels next winter. Then we came straight here. The caravan of 125 camels arrived on the same day that we did.

After getting the party at work I made a five day exploration westward to find a suitable trail for the caravan to follow. Then I returned and got the camels started two days ago (May 1st). They will go on as fast as possible and we will overtake them. We'll spend another 10 days in this region and then start west. In the mean-

time I expect to explore the country between here and Iren Dabassu and will leave this letter at the telegraph station hoping someone will take it out.

A short exploration toward Iren Dabassu has shown that there are great areas of beautifully exposed sediments and that they contain rich deposits of fossils. Probably there is enough for an entire season's work. We will stop here again this September and work more but I want to get started westward soon.

We are earlier in the field than in any previous year. Thus far, all my plans have gone like clockwork. I laid out the whole program for getting away last January and the machinery moved exactly to specifications. We were very fortunate in every way.

The camels are in fine condition—Tserin, I have made the caravan leader. All the staff is keen and we have a happy family in camp. This fortnight has been *very* trying because of the continual sand storms but they have stood it well. I know of few things more nerve-wracking. However all of us will be glad to start west. The deposits here are very rich indeed and we feel quite sure that they will warrant a party working here all next summer. We will almost certainly leave some men here.

This quarry is particularly important because apparently it gives a complete exhibit of the fauna of the region. Rodents, insectivores and other small things are as well preserved as are the larger specimens. A fine premolar tooth of *Andrewsarchus* has turned up, femur of Eudinoceras, also canine tooth of same. I am hoping we will get some Primate stuff before the quarry is exhausted. There seem to be weeks of work in it still waiting to be done. We'll have another go at it in September.

You will not hear from us again till about September.

The letter concludes with an account of the injury suffered by Doctor Andrews through the accidental discharge of his revolver while attempting to shoot an antelope, and of the very skillful and successful treatment of a serious wound in the thigh by the surgeon of the party, Doctor Perez, under most difficult circumstances, when dust storms penetrated the hospital tent and covered every object in the camp.

STOLL-McCRACKEN EXPEDITION

THE STOLL-McCRACKEN ARCTIC EXPEDITION cables that it has been successful in obtaining a g od series of specimens of the giant brown bear of Alaska, one individual being of especially large size. Some of these specimens will be used in the preparation of a habitat group for the American Museum.

FISHES

FISHES FROM THE WHITE NILE.—A collection of fresh-water fishes from the Nile obtained by the Taylor Sudan Expedition of 1927, fill a gap in the Museum's extensive series of African material. A short report on them in *Novitates* is accompanied by general discussion of the fresh-water fish faunæ of Africa. There are there two clearly marked faunæ. One, the most typically southern, occupies the Nile, Congo, and West Africa in general; the other, with more affinity to that of the Indian region, occupies East and South Africa.

The continental fresh-water fishes of the world may be divided into two main faunæ, those of the northern continents contrasting with those in Africa and South America, which have much in common. In the main, however, they seem to have entered the two southern continents from the north, independently, and at about the same period.—J. T. NICHOLS.

HISTORY OF THE EARTH

In an article "Volcanoes in Action" by Chester A. Reeds in the May–June number of NATURAL HISTORY, it was stated that the next eruption of the volcano Mayon in the Philippine Islands would in all probability be exceptionally violent. Two months after this forecast was made, an Associated Press dispatch from Legassi, P.I. dated July 1, was received in New York, which stated that the volcano had been in violent eruption since June 21, that the coast town of Libog with a population of 7000, and several villages near the eastern base of the volcano had been virtually destroyed by lava flowing from the volcano, and that two army aviators, Lieutenants George W. Goddard and John D. Corkville, who flew over the crater June 30, reported that the crater was about 400 feet in diameter, and was filled with molten lava.

Some accounts give the height of the graceful cone of the volcano as 7916 feet, others as 8274 feet, and 120 miles in circumference at its base, which is surrounded by an extensive plain. The volcano is only six miles distant from the eastern shore of Albay Province, in southern Luzon, the largest of the Philippine Islands.

The volcano has erupted frequently since 1616, the date of the first recorded outburst. There were 26 eruptions during the Nineteenth Century, those of February 1, 1814, and June 25, 1897, being of great violence. The last outburst previous to the June, 1928, eruption, was in March, 1900, and it was chiefly upon the length of the quiescent period, 1900–1928, and our present knowledge of volcanic activity, especially of Vesuvius, that the violent nature of the June eruption of Mayon was predicted.—C. A. REEDS.

DR. ROBERT BROOM, of South Africa, has just arrived in New York on a two months' visit to the American Museum. He has brought with him a few very interesting South African fossil reptiles. The most important of these specimens

is a practically complete skeleton of a Gorgonopsian reptile. The Gorgonopsia are particularly interesting because they are very near to the ancestors of the mammals. Heretofore we have known only one skeleton, which is in Russia, and that is not very perfect, the feet being lost, and the bones being in a rather unsatisfactory condition. This new South African skeleton reveals all details of the structure of both the anterior and posterior limbs. It also shows that the Gorgonopsia had an ossified breast bone. Doctor Broom hopes, while in New York, to make a further study of the specimens of the South African reptiles in the Broom collection, which was acquired by the Museum fourteen years ago, in view of a monograph which he hopes to publish on the South African fossil reptiles.

We regret that Doctor Broom has been suffering from bronchitis and asthma during the past year, and he feels that he will not be able to stand the winter climate in New York, otherwise he would be only too pleased to make his visit longer.

It is fourteen years since Doctor Broom was last with us, and he says he is greatly struck with the marvelous advances the Museum has made in this time. He is especially interested in the wonderful finds that have been made in Mongolia.

A RECENT PRESS ARTICLE OF THE CARNEGIE INSTITUTION is devoted to the Unique Language of the Trees, dealing with the records of climate as translated by Andrew E. Douglass and Ellsworth Huntington from a study of their rings of yearly growth, and suggesting that the records may be extended to include Sun Spot Cycles.

The information as to periods of abundant or scanty rainfall conveyed by the yearly rings of the Big Trees compares very closely with that obtained by Baron de Geer and his students from a study of the clay deposits (varves) made in past times by rivers here and in Europe.[1] The principal illustration in the article is of the section of the Big Tree in the American Museum, bearing a record of a few of the notable events that happened during the tree's lifetime. How much happened will be given in more detail on the chronological labels now being prepared in accordance with a request of President Osborn.

MAMMALS

ADDITIONS TO THE VERNAY-FAUNTHORPE COLLECTION.—Mr. A. Dunbar Brander, formerly Conservator of Forests in India, and author of *Wild Animals in Central India* has recently made a very interesting addition to the proposed Asiatic Hall of the American Museum of Natural History—namely, a good specimen of the very rare four-horned antelope (*Tetraceros quadricornis*). Colonel J. C. Faunthorpe contributed a pair of specimens a year or two ago. In connection with this valuable gift, Colonel Faunthorpe writes (June 14, 1928):

> I have now obtained a good specimen which has all four horns developed, and am shortly sending this out, together with the skeleton and measurements, also two skulls illustrating the other types of head. (These are a gift of Mr. A. Dunbar Brander.) You may remember that a year or two ago we sent you a pair of four-horned antelope (*Tetraceros quadricornis*) specimens. The male specimen, as frequently happens, had not the front horns developed, these being merely indicated by lumps of bone under the skin. It is an interesting fact that in this species about thirty per cent of the males have four distinct horns, another thirty per cent have the back horns fully developed, the front horns merely consisting of little knobs coming through the skin, while the remainder have no front horns at all, but merely small protuberances in the bone of the skull, which are completely covered by skin and hair. It may be that the tendency in this species is to lose the front horns altogether. This no doubt would take a very long time to become complete.

The Museum has greatly desired to secure a still more rare, nearly extinct species in India—namely, the Asiatic lion (*Felis leo goojratensis*) and the necessary permission has been obtained. Regarding this, Colonel Faunthorpe writes:

> . . . . it was a great disappointment to me that I fell ill and could not go to Kathiawar after it in March. Unless the local potentate changes his mind, I hope to be able to obtain this very rare specimen next winter.

SCIENCE OF MAN

CHILDREN RUNNING ON ALL FOURS.—Dr. Aleš Hrdlička, who has recently published a series of observations on "children running on all fours" for a shorter or longer time before walking, says in the *American Journal of Physical Anthropology*, Vol. XI, No. 2. "There is no doubt any more but that we are facing here a phenomenon of no mean order."

Doctor Hrdlička discusses additional and exceedingly interesting reports, which he sums up under the following Résumé:

> With the much larger number of cases at our disposal and the more circumstantial reports in many of these, it seems possible now to formulate some fairly definite views regarding the phenomenon here dealth with. These are:
>
> 1. The human infant, in probably all races and of both sexes, develops in more or less infrequent instances, instead of crawling, the peculiarity of running effectively and with facility on all fours.
> 2. The manifestation replaces that of crawling, mostly completely, sometimes partially, and tends to end when walking commences, but in numerous cases is indulged in irregularly for shorter or longer periods thereafter. The child prefers and enjoys the performance.
> 3. The children showing the peculiarity are, as a rule, healthy, strong, active, and, in general, above rather than below the average. There is no indication that the tendency is associated with any either constitutional or acquired weakness or defect.
> 4. The determining causes of the manifestation lie evidently in the child's conformation at this period and in the desire of the healthy and strong child to get about more quickly than by crawling; the basic cause, however, is apparently of atavistic nature, the whole phenomenon being thus one of the order of functional reminiscences of an ancestral condition.
> 5. Direct heredity plays, it seems, but a secondary rôle in these cases; but the subject needs a thorough further inquiry.
> 6. Some of the children that run on all fours show sooner or later other functional or somatic peculiarities which deserve scientific attention.

[1] See the article "Baron de Geer and His Work" by James F. Kemp in NATURAL HISTORY for 1921, pp. 31–33.

MEETINGS OF SOCIETIES

THE GENEVA CONFERENCE FOR BIRD PRESERVATION.—A notable gathering for the preservation of wild life took place in Geneva, Switzerland, in May, 1928. This was the third biennial meeting of the International Committee of Bird Preservation, a movement originating in London in June, 1922, under the leadership of Dr. T. Gilbert Pearson, who with Lord Edward Gray, Lord Buxton, M. Delacour, Mr. Van Tienhoven and other prominent Europeans met in the home of Reginald McKenna for this purpose. National sections of the committee composed of official representatives of leading scientific societies, museums, and conservation organizations are now in operation in twenty countries.

At the Geneva meeting definite plans were laid for legislation and international treaties which it is believed will have beneficial effects on preserving the persecuted bird life of the world. The resolutions and other propositions of the International Committee will be laid before the assembly of the League of Nations at its meeting in September this year. The Committee has engaged an active European secretary in the person of Dr. J. M. Derscheid of Brussels. A series of lectures will be organized in France in the beginning of autumn and a wide publicity campaign in the press of Italy has been determined upon. The publication of literature and its distribution in the schools of Hungary will soon begin. The expenses of this international movement for bird protection thus far have been borne by the National Association of Audubon Societies of which Doctor Pearson is president.

NEW PUBLICATIONS

The newest addition to the splendid series of Putnam's field books is the *Field Book of North American Mammals*, by H. E. Anthony (xxvi–625, 32 color plates, 16 photographic plates, 119 text figures, 40 maps in text, 1 folded life-zone map). 1928. G. P. Putnam's Sons. New York.

This book by the American Museum's curator of mammals is the first and only complete guide to the mammals north of Mexico; in it all the 1445 forms are named. The data accompanying each has of necessity been brief, though included for each subspecies are the common and the scientific names, a description of the pelage, measurements and range. The book, being primarily designed for laymen, depends chiefly on external characters and range maps supplemented by numerous illustrations for the identifications. For each species or group of closely related forms whose habits are similar, there is given a general account of the habits and most salient relations. Often the chief habitats are described. The book will enable anyone with "good eyes and ears and a fair amount of patience" to name the animal in question. In addition, enough of interest concerning the species may be had to fix it well in one's memory. The book, being but $4\frac{1}{2}\times7\times1$ inches, fits well within one's pocket.—R. T. H.

Fur Farming for Profit, the MacMillan Company, by Frank G. Ashbrook, combines the information and experience gained by the author, through many years' connection with the Biological Survey at Washington. As Mr. Ashbrook says, the breeding of fur animals is still in its infancy, yet it is now a healthy infant, and this book will fill a growing demand for information in regard to it.

Naturally a large portion of the book is devoted to the silver fox, since, owing to the high prices brought by its fur, success in raising it brings large returns. For many years the great profits lay in raising and selling foxes for breeding purposes, and very few pelts appeared in the annual sales; but this has now changed. The number of skins from fox farms has steadily increased, and in 1925 one Wisconsin company alone sold over 4000 skins.

Following the foxes, the more familiar fur-bearing animals are treated, including even the fisher and beaver—particular attention being given to the muskrat, which has become practically our most inportant fur-bearer and the one most widely distributed and most readily utilized.

The habits of each animal are dealt with. Then follow directions for selecting a ranch site, and instructions as to the care and management of the captive animals. Above all, emphasis is laid upon the need of care if the would-be fur farmer wishes to be successful; care in the selection of the locality of a fur farm, care in the selection of the breeding stock and in handling it, and finally care in the preparation of pelts for market.

Besides the native wild fur-bearers, the domesticated rabbit is dwelt on at some length, as well as the two foreigners, the pretty little chinchilla and the karacul sheep.

All in all, this book will satisfactorily answer the inquiries that have from time to time been made of the library for information in regard to fur farming.—F. A. LUCAS.

THE FOLLOWING PAPERS have been published in *Novitates* and the *Bulletin*, during the period from January 12 to June 23, 1928.

Novitates

No. 293. New Birds from Mexico and Panama. By Ludlow Griscom. 6 pp. January 12, 1928.

No. 294. The Smallest Known Specimens of the Sucking-fishes, *Remora brachyptera* and *Rhombochirus osteochir*. By E. W. Gudger. 5 pp. Two text figures. January 28, 1928.

No. 295. The Systematic Position of the Phallostethid Fishes, with Diagnosis of a New Genus from Siam. By George S. Myers. 12 pp. Two text figures. February 1, 1928.

No. 296. A New Melanotæniin Fish from Queensland. By J. T. Nichols and H. C. Raven. 2 pp. One text figure. February 1, 1928.

No. 297. A New Mammalian Fauna from the Fort Union of Southern Montana. By George Gaylord Simpson. 15 pp. Fourteen text figures. February 2, 1928.

No. 298. Stones of Celtis in the Tertiary of the Western United States. By Edward W. Berry. 5 pp. Six text figures. February 3, 1928.

No. 299. Odors and Insects. By F. W. Brown. 9 pp. February 10, 1928.

No. 300. Carpenter Bees of the Genus *Mesotrichia* Obtained by the American Museum Congo Expedition, 1909–1915. By Norma LeVeque. 23 pp. Twenty-nine text figures. February 21, 1928.

No. 301. Bones of Birds from the Ciego Montero Deposit of Cuba. By Alexander Wetmore. 5 pp. Two text figures. February 29, 1928.

No. 302. Additional Specimens of Fossil Birds from the Upper Tertiary Deposits of Nebraska. By Alexander Wetmore. 5 pp. Two text figures. February 29, 1928.

No. 303. Two New Fossil Amphibia of Zöogeographic Importance from the Miocene of Europe. By G. K. Noble. 13 pp. Six text figures. March 21, 1928.

No. 304. Enzymes and Bacteria in the Honey Bee. By F. Martin Brown. 5 pp. March 29, 1928.

No. 305. A New Species of Bacteria and the Gall of an Aphid. By Frank E. Lutz and F. Martin Brown. 4 pp. March 29, 1928.

No. 306. Some Plethodontid Salamanders from North Carolina and Kentucky with the Description of a New Race of *Leurognathus*. By Clifford H. Pope. 19 pp. One text figure. April 14, 1928.

No. 307. American Eocene Didelphids. By George Gaylord Simpson. 7 pp. Five text figures. April 14, 1928.

No. 308. A New Species of Waxbill (*Estrilda*) from the Southeastern Congo. By James P. Chapin. 3 pp. One text figure. April 24, 1928.

No. 309. A New Fishes from the Southeast Corner of the Congo Basin. By J. T. Nichols. 4 pp. Three text figures. April 24, 1928.

No. 310. A Mackerel (*Scomber scombrus*) with a Rubber Band Rove Through Its Body. By E. W. Gudger. 6 pp. Three text figures. April 24, 1928.

No. 311. The Histological Nature of Ossified Tendons Found in Dinosaurs. By Roy L. Moodie. 15 pp. Six text figures. April 25, 1928.

No. 312. Multituberculates in the Wasatch Formation. By Walter Granger and George Gaylord Simpson. 4 pp. Two text figures. May 14, 1928.

No. 313. The African Cuckoos of the Genus *Cercococcyx*. By James P. Chapin. 11 pp. One map. May 16, 1928.

No. 314. New Central American Snakes in the American Museum of Natural History. By Emmett Reid Dunn. 4 pp. May 16, 1928.

No. 315. Results of the Douglas Burden Expedition to the Island of Komodo. IV. Frogs from the East Indies. By Emmett Reid Dunn. 9 pp. May 18, 1928.

No. 316. Results of the Douglas Burden Expedition to the Island of Komodo. V. Observations on the Habits and Distribution of *Varanus komodoensis* Ouwens. By William Douglas Burden. 10 pp. One text figure. May 18, 1928.

No. 317. New Asiatic Mammals. By Glover M. Allen. 5 pp. May 19, 1928.

No. 318. The Whale Shark, *Rhineodon typus*, Near Havana Harbor, Cuba. The Fifth Record from the Straits of Florida. By E. W. Gudger and W. H. Hoffmann. 7 pp. Three text figures. June 5, 1928.

No. 319. Fishes from the White Nile Collected by the Taylor Expedition of 1927. A Discussion of the Fresh-water Fish Faunæ of Africa. By J. T. Nichols. 7 pp. June 23, 1928.

No. 320. Seven New Reptiles from Fukien Province. China. By C. H. Pope. 6 pp. June 23, 1928.

Bulletin

Bulletin LVII, Art. V. An Ornithological Survey of the Serra do Itatiaya, Brazil. By Ernest G. Holt. 76 pp. Plates VI to XIX. June 7, 1928.

Art. VI. Diptera of the American Museum Congo Expedition. By C. H. Curran. 73 pp. Seven text figures. June 9, 1928.

REPTILES AND AMPHIBIANS

Central Asiatic Reptiles.—Mr. Clifford Pope has returned from a trip to Chicago where, with Mr. Karl P. Schmidt of the Field Museum, he spent ten days studying his last collection of reptiles made for the Central Asiatic Expedition in China. The collection includes about 2600 specimens, among which are representatives of more than ninety species, nearly all of which are from Fukien Province. The previous collections of reptiles and amphibians made by the Central Asiatic Expeditions have been reported by Mr. Schmidt. Mr. Pope's complete report, which will appear in a subsequent *Bulletin*, will include all of the American Museum's Chinese reptiles not already reported on. Twelve new forms have been described by Mr. Pope in recent *Novitates*.

THE ALBERT OPERTI LOAN EXHIBITION OF PAINTINGS

During the three weeks beginning June 15 there has been displayed in Education Hall a a loan series of 52 paintings and sketches by the late Albert Operti, arctic and marine painter. These were loaned through the courtesy of a number of his friends, mostly members of the American Museum staff.

The exhibition represented a cross section of Mr. Operti's work rather than a collection of his more important paintings, such as hang in the Capitol at Washington. Examples of these latter are not lacking, however, since the two large canvases of whaling scenes belong in this category.

The collection of sketches was particularly rich in views of arctic scenery and of shipping at sea, which comprised the artist's most characteristic field, if one may say that such a versatile painter had a characteristic field. The exhibition also showed some representative examples of Mr. Operti's glimpses of oriental life, executed in vivid color, many of which were painted from memory. In a prominent position was a bust of Mr. Operti, the work of Mr. N. J. Burns. The paintings and sketches were loaned by Doctors Reeds and Miner, and Messrs. Arogast, Beers, Conolly, Dill, Faunce, Klassen, Meyenberg, Mueller, Olsen. Pindar, Quinn, Short, Siebert, Southwick, Whitlock, and Miss Callahan.

NEW MEMBERS

Since the last issue of Natural History, the following persons have been elected members of the American Museum, making the total membership 10,525.

Life Members

Mrs. Bonnie Wallace Le Clear.
Mr. Rufus King.

Sustaining Member

Mrs. Charles D. Dickey, Jr.
Mr. Chauncey B. Carver.

Annual Members

Mesdames Henry James, Gilbett W. Kahn, Arthur M. Lewis, Roger Lewis.

Misses Harriette C. Frazier, Margaret E. Lewis, Mary Fraser Long.

Rev. Charles E. Brugler.

Dr. J. P. H. Marker.

Messrs C. Graham Bacon, Leon M. Coles, Gifford C. Ewing, George C. Fraser, Jr., Harold H. Hall, Henry A. James, H. Kirkland Jones, Jr., Gilbert W. Kahn, Kingsley Kunhardt, William H. Labrot, Frederic W. Lincoln, Robert Oppenheim, Hugo Ries, David Vorhaus.

Associate Members

Mesdames Rosa Smith Eigenmann, K. L. Johnston, Alfred Kahn, J. F. Loughborough, K. C. Parrish, Spencer Tallmadge, Ida Benter Von Loewenfeldt.

Misses Daisy Achey, Edith R. Force, Enid Townley.

Prof. P. F. English, Alton S. Windsor.

Doctors R. L. Alsaker, Harold A. Bachmann, Stanley S. Burns, H. M. de Burlet, Thos . P. Hinman, Hedwig S. Kuhn, Jason L. Wiley.

Lieut. Dale V. Gaffney.

Ensign D. C. E. Hamberger.

Messrs H. Anderson, Jr., L. B. Andrus, Sawnie A. Aldredge, Frederick G. Bonfils, V. R. Brogdon, Wilfred S. Bronson, Eugene G. Cayce, Edward Grieg Clemmer, Joseph P. Cross, J. W. Cruthers, Milton S. Dillon, J. Doorschodt, E. B. Douglas, Mark R. Dull, H. A. English, Henry Fowler, John T. Gamble, D. F. Gillain, F. Godber, Stanley G. Hardwick, Joseph Hawley, K. C. Heald, Jas. B. Hill, G. W. Johnson, Jerome Kessler, Ira N. Levison, Wm. Bross Lloyd, Emilio Masnata, G. E. Meyer, J. Mulher, Russell T.

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